MODEL AIRPLANE NEWS

JANUARY 1949 · 25 CENTS

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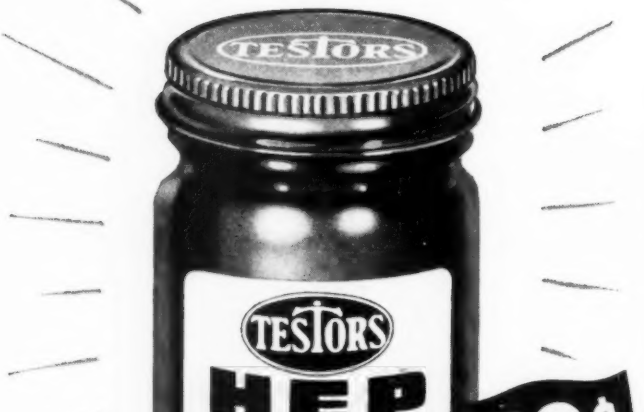

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AIR FORCE has cancelled its first major aircraft procurement contract and rung up its first blunder since achieving its independent status—which only proves it is just as human as its predecessors under the War Department. Insiders had long suspected that other night fighters were superior to the Curtiss XF-87 four jet design, which weighed as much loaded as the Boeing B-17 four engined bomber empty. AF began the ill-fated contract by awarding Curtiss-Wright $1,500,000 for production tooling on the design while simultaneously ordering a powerplant change. The four Westinghouse 24C jet units were to be replaced by two General Electric TG-190 engines, which would have given the black fighter the same power but considerably less drag by the use of much smaller nacelles. With this change in mind, AF last June ordered 58 model F-87 fighters and 30 F-87A photo-reconnaissance versions at a cost of about eighty million dollars. Flight tests on the prototype XF-87 proceeded at Muroc Base, but it soon became painfully evident that the big plane had neither the speed nor the range of its competition—for AF had reckoned without the new Northrop XF-89 and the equally new Douglas XF3D-1 Navy night fighter. The XF-89 has zoomed through its Phase I tests with hardly a hitch and in record breaking time has moved into Phase II tests. Now AF has cancelled the entire F-87 project and is debating between the F-89 and the F3D, even though the latter was designed to a Navy specification.

Latest Navy all-jet plane now undergoing tests in the Douglas XF3D-1 *Skynight*. This all weather shipboard fighter is powered by twin Westinghouse jets and carries extensive radar equipment

McDONNELL XF-85 finally made it! Yes, the Buck Rogers craft, which operates from a mid-air trapeze, has completed successfully its initial launching and retrieving operations suspended from the belly of a Boeing B-29 "mother" plane. Readers will recall that on the first test flight, test pilot Ed Schoch smashed into the trapeze and was forced to land on the desert lake bed far below. Repairs took more than a month and the tiny jet fighter was again taken aloft. After leaving its trapeze it squirted around for 20 mins. and came home to roost without incident. Although the tiny fighter is intended for operation from the forward bomb bay of the Convair B-36A bomber, and although the B-36A is being built with special provisions for the craft, AF is not expected to order the parasite into production beyond the two experimental aircraft. Tactical difficulties in such operations appear insurmountable.

UNITED HELICOPTERS, INC. was awarded an Approved Type Certificate by CAA for its Hiller 360 craft, thus bringing to fruition the controversial and highly publicized efforts of 23 year old Stanley Hiller to produce a successful helicopter. The ATC permits Hiller to manufacture the design for commercial sale and he hopes to produce the two place craft for less than $20,000. (In case you think that's a lot of money, the Bell helicopter sells for $39,500 and the Sikorsky model for about $75,000!)

CONSOLIDATED VULTEE Aircraft Corp., a short time ago one of the aircraft companies floundering in the red, may well be on the comeback trail with new orders. First step was a firming up of the Convair B-36 production order for 95 airplanes, a contract once set for severe cutbacks. Recently Convair received a $5,000,000 contract for production of Boeing B-50 sub-assemblies, a production contract to build 29 Northrop B-49A Flying Wing bombers and, most recently, a $30,000,000 contract for production of T-29 multi-place trainer versions of the Convair Liner. This latter contract followed a nip-and-tuck race with the Martin 2-0-2 liner, the Convair getting the nod at the last minute.

ENGINES AND MORE engines for the Air Force! Recently announced have been the Wright T-35 turboprop, the Wright Turbo-Cyclone 18 and the Pratt & Whitney R-4360-VDT engines, all of which make use of hot gases flowing through a turbine, the basic principle developed by Frank Whittle. Each of the engines uses these gases in a different way and are practically three entirely new and different power plants.

WRIGHT T-35 TYPHOON is a conventional aircraft gas turbine engine with one important difference: instead of ejecting the gases through a nozzle as in jet propulsion, these gases are used to drive a huge, four blade propeller. First test flights of the powerful unit, which develops 5500 hp. were made in a special five engined B-17. The surplus bomber was converted into a flying test stand by installing the huge turboprop engine in the nose. The craft

(*Turn to page 62*)

MODEL AIRPLANE NEWS
JAY P. CLEVELAND
Publisher

Serving Aviation 20 Years
JANUARY 1949 VOL. XXXX—No. 1

CONTENTS

TOWLINE GLIDER
Kilroy Is Here!....10
FLYING SCALE DIESEL
Model Parakeet....18
CONTROLINE MODEL
Pfalz D 12....27
WYLAM MASTERPLAN
De Havilland I (Part 2)....24
PLANE OF THE MONTH
Four for Two—(Atlas H-10)....17
SCIENCE
Design Forum....13
To Cowl or Not to Cowl....14
Stable Airfoils....22
Basic Radio Control....25
Automatic Rudder Off-Set....35
WORLD WAR I
Nieuport 28....21
3 VIEWS
Atlas H-10....16
Hawker Tempest II....26
NEWS
Flash News....1
Report From The West....6
Scrap Box....8
Air Ways....30
Start 'Em With Rubber....34
It's Time for A Change....36
News of Modelers....59
Club News....59

COVER—The attractive *Gee Bee Racer* was built by Robert Haack, and is an exact copy of Loweil Bayles' racer. Span is 32" and the model was flown several times without mishap, powered by an *Ohlsson 23*. In our photo a *Bullet* is installed, but Mr. Haack feels he shouldn't push his luck too far and will soon install a dummy P & W motor and use the ship for display only. Construction is built up throughout except for tail surfaces; fuselage is nylon covered, with tissue on wings. The model is finished in authentic black and yellow, as was the original.

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Published monthly by Air Age Inc., Mt. Morris, Illinois. Editorial and Advertising offices: 551 Fifth Ave., New York 17, N.Y. Jay P. Cleveland, President and Treasurer; Jos. M. Mann, Sec'y. Entered as second class matter Dec. 6, 1934, at the post office at Mt. Morris, Ill., under the act of Mar. 3, 1879. Additional entry at New York, N.Y. Price 25c per copy in U.S. **Subscription Rates**—Within U.S. only: 1 yr. $2.50; 2 yrs. $4.75. In Canada: 1 yr. $3; 2 yrs. $5.75. All other parts of the world: 1 yr. $3.50; 2 yrs. $6.75. **Change of Address**—Four weeks notice required. Be sure to send your old address (preferably imprint from a recent issue.) Give new postal zone. Write to: "Subscription Dept." Model Airplane News, 551-5th Av., New York 17.

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blue, green	.10
Silk, per yard	.25
Brushes	.10
Cement (tubes)	.10 & .25
Rail Stripper	.25
Leveling Gear Wire /8.1/32"	.05
1/16"	.10
Leveling Gear 2 bolts, 6 for	.25
Landing Gear washers 3/32" or 1/8", 12 for	.05
Celluloid 8" x 10"	.10
Washers, 3/8" 12 for	.05
1/8" 24 for	.05
Ball Bearing Washers 1/4, 3/8	.10
Plastics Bac	.25
Fillet Foil	.35
Wheel Collar & Nut, pr	.25
Alum. Tubing, 1/16",1/32",1/8"	.15
(per ft.) 3/16",1/4"	.20
Copper Tubing 1/8"OD, per ft.	.20
Brass Tubing 1/16", 3/32",1/8"	.15
Steel Aluminum (eq ft) .010"	.20
.020"-.55, .032"-.75, .064"	1.25
Sheet Brass (3"x12") 1/64"	.25
1/32"	.35
(12"x12") 1/32"	.50
1/16"	.60
Sheet Copper (12"x12") 1/64"	.30
1/32"	.40
Plywood (6"x12") 1/32"	.25
1/16"	.50
1/8"	.75
3/16"	1.00
Masking Tape 1/8"(3) ft	.10
1/4"x30 ft	.25
Epoxies 1/16", 3/32" 12 for	.05
1/8" 12 for	.10
Dowel 1/16,1/8,3/16,1/4 /ft	.05
Sandpaper, assorted pack	.05

U-CONTROL ACCESSORIES

30 lb. Braided Nylon 55 ft	.65
Stainless Steel Wire 100 ft	.60
140 ft	.75
200 ft	1.00
Stranded Speed Wire 50 ft	.25
70 ft	.35
100 ft	.50
200 ft	1.00
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Stunt Bellcrank & Elev. horn	.25
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Horns (bellcranks)	.10
	.15
Speed Indicator Tubular	.10
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Jumbo CO2 cartridge	2.00
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Props	.25
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Stinson 30" (prefab.)	.75
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Roberts Racer 20"	1.50
Cobra (prefab.)	1.50
B-5 21"	1.50
Squirt Speed Gear	6.50

For Comet A-200:

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SE-5 21"	1.50
Aeronca Champ 18"(prefab)	.75

For GH CO2:

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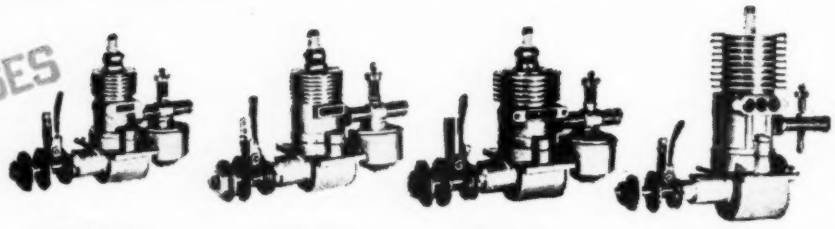

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Displacement	.199	.299	.350	.610
Bore	.66	.812	.880	1.00
Stroke	.562	.562	.562	.777
Horsepower	1/7	1/6	1/5	1/4
RPM	7,500	6,000	8,500	9,000
Propeller	6"	10"	11"	12"
Weight (ozs.)	4	4½	4½	9

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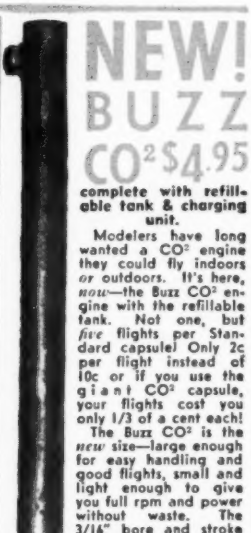

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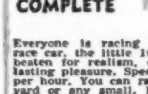

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REPORT FROM THE WEST

by "Tip" Hannon

THIS month we will start things off with a few notes on some of the activity up North.

R. D. Smith wants us to know that modelers in his area (around Portland, Ore.) are very busy and that his club, the *Fireballs*, which was formed last January holds meetings in the Kellog Park Recreation Bldg.

This club, which is strictly U-control (it *should* be—Jim Walker hails from Portland!) held their first meet in February, a novelty being a "cross country" event in which each contestant endeavored to get as much time built up in a 10 minute period without any one flight exceeding 3 min.

The *Fireballs* have had representatives at every event in the Ore.-Wash. area and have gathered their share of loot, both in speed and stunt classes.

Thanks for the information, R. D., and be sure to send occasional reports to M. A. N. so that notes of Oregon activities will appear in our "Club News" column.

* *

Another group, the *Apple City Flight-Liners* of Wenatchee, Wash., has been heard from via E. G. Straley, Sr., Club Advisor. This club was formed in July '46, with the name of *Wenatchee Modelers*, and affiliated with A.M.A. early in 1947. The name was later changed to identify the club more closely with the principal product of the area. One of the important activities of this group is to stage a U-control model plane show at the annual Apple Blossom Festival. These shows have proven highly popular the last two years and will be continued as a feature attraction at the Festival. This year Jack Hudspeth, Oregon State Junior Stunt Champ, and several other members of the *Fireballs* were guests and really put on an outstanding stunt show. A sharp upturn in model interest is expected as a direct result of the 1948 Festival show, and Mr. Straley wants us to thank the *Fireballs* through these columns for their aid.

* *

Just about all the meets of any importance have been put to bed and the modelers are now thinking up new gems for next year's series of contests. Rambling up and down the Coast recently we ran across quite a few items that should be aired here . . .

It appears many model flyers have been under the impression that the Jim Walker Trophy for Novelty Stunt flying was to become the permanent possession of any person who won it three times. Since Davy Slagle chalked up his third win this year, the boys have been asking why he wasn't listed as the permanent winner. Not knowing the answer to this one, we started checking and finally got the answer direct from Jim Walker himself through AMA Headquarters. It seems that the trophy was never intended as a 3-times-and-out deal, but was put up to perpetually encourage this type of flying. Hope this will put everyone straight on this particular trophy.

* *

Note: Understand that the West, long a stronghold of record breaking model airplanes, has had to sit up and take notice of the fine flying and record-setting being put on by some of the Easterners. Good competition like that is always welcome.

* *

As long as we are in a reminiscing mood, let's go 'way back to the All Western Open. Gathered around the various flying circles were quite a few prominent oldtimers and manufacturers. Couldn't hear what they were saying, but the old chatter was really going fast and furious. Up to this austere group a little 10-year-old dared to break into the conversation and ask what the record for Class B Junior was. "I don't know," most of them said and went on with their chit chatting. But the youngster persisted; he wanted some sort of an answer. Finally, from one of the group came: "Oh, about 102 or 103." "Well, I just broke it," said the little fellow, "Just made better than 110." The group laughed—quite loudly at that.

Bud Converse prepares to launch his original design Wakefield model; it flew O.O.S. on this test flight

Well, the laugh is on them. Because, as of the All Western Open, 110.39 mph set by this same little fellow—10-year-old Steve Jentges of 116 N. Baker St., Santa Ana, Calif.—was the record. Credit should be given where due and it's our fault that Stevey didn't get some recognition before this in this column. His feat proves that you don't have to be an expert to get up there with the best of them. Stevey flew a rather conventional job designed by Tom Jentges. It weighed in the neighborhood of 17 oz., and had a feature that you don't see much nowadays—a solid balsa wing.

That record may have been busted sky high by this time, but the fact remains that a 10-year-old got up and showed his wares—and wares that have 110.39 mph attached to them in a Class B Junior event are worthy of a lot of recognition. It is on the shoulders of such fellows that the future of model airplaning rests. With performances like that I'm sure there is a rosy future for airplanes for many moons to come.

Now that we have hashed over some of the "ancient" stuff, let's go over the first annual Radio Control contest that was held the later part of September out at Western and Rosecrans. Only five contestants ap-

(*Turn to page* 52)

Bob Baum of L. A. with his 7 year old original, powered by *Tiger Aero* motor

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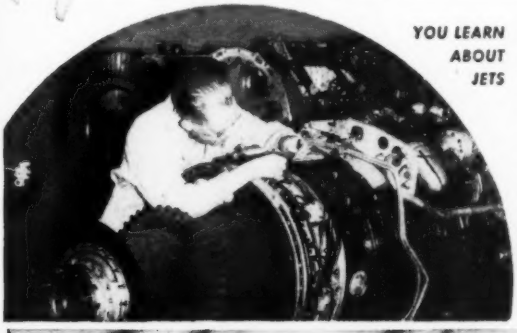

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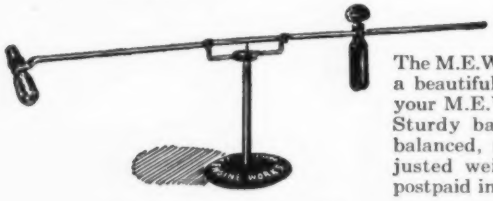

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SCRAP BOX

By BILL WINTER

REACTION was swift to the statement two issues ago that speed flying had become dangerous and that the U-controllers should take it upon themselves to clean house before unfavorable reaction could jeopardize all powered flying. Clarence Wells, of the *Bristol, (Pa.), Aeromodeleers,* turns this discussion into a vigorous two-sided argument.

"I was an old free flighter from the thirties until recently," Clarence warms up. "I think it is swell to encourage free flight but please don't make speed fliers think that control flying is on its way out because over 70% of the East is composed of control fliers, of which fully half would build nothing if speed flying was done away with.

"Sure, I know it seems unscientific to stick a Dooling in a hollow piece of pine and let it race around, but it would take a heck of a sleek ship to beat some of these guys. Any old free flight will hook a thermal (two issues hence we'll have to defend ourselves from the free flighters) if it's properly adjusted. Most fellows won't admit it but they like to have the luck element around; we want fun put back in model building. I don't have fun trying to beat machinists, tinsmiths, and hot-fuel chemists, but I certainly cannot see my way clear to condemn control line.

"We have it with us and it's taken nearly every junior member, too." Wells gives out. "That's bad. I think an easier solution could be arrived at if contest directors would get together in given regions—as the Midwest, the Coast—and plan precision and novelty control flying. Then the fliers would have no alternate and they would like it, too."

Thanks, Clarence, that helps clear the air. Before going deeper into this speed business, this *Aeromodeleer's* outfit deserves special comment. Although Bristol has only 18,000 population, they have 40 members in the club, 30 being under sixteen. At nearby model meets Bristol has a turnout of fifteen members, while much bigger Trenton—across the Delaware in New Jersey—is hard put to check in with five. The Bristol boys say Trenton doesn't encourage the juniors. Bristol has a goal of 20 juniors entered in all area contests during 1949.

But, Clarence, you have done us wrong. The custodian of the *Scrap Box* has nothing against speed flying! We do have strong misgivings against the trend in speed flying, and in that many of the nation's top notch pilots agree. But more of this anon.

Energetic Jim Walker, the man who started U-control in the first place, is boosting the idea of an enclosure for speed events. "After reading the last issue of MODEL AIRPLANE NEWS . . . I think the need for this should be even more apparent," Jim advises the Academy. "You will notice . . . remarks concerning possible limitation on speed, damage to plane caused by pull tests, and other topics, such as difficulty of judging speed."

Stating that any brake upon all-out speed will never be popular, Walker argues that as long as flying is done inside a barrier there is no reason for a pull test, limitations on minimum wire sizes, or any limitations on speed. This suggestion is getting wide national consideration by many leaders.

(*Turn to page* 42)

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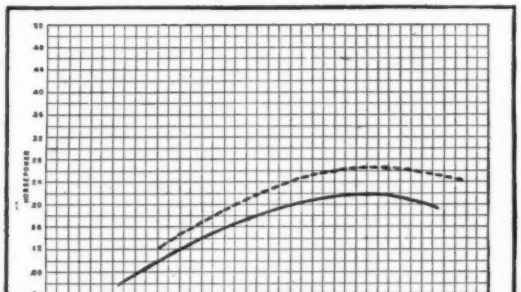

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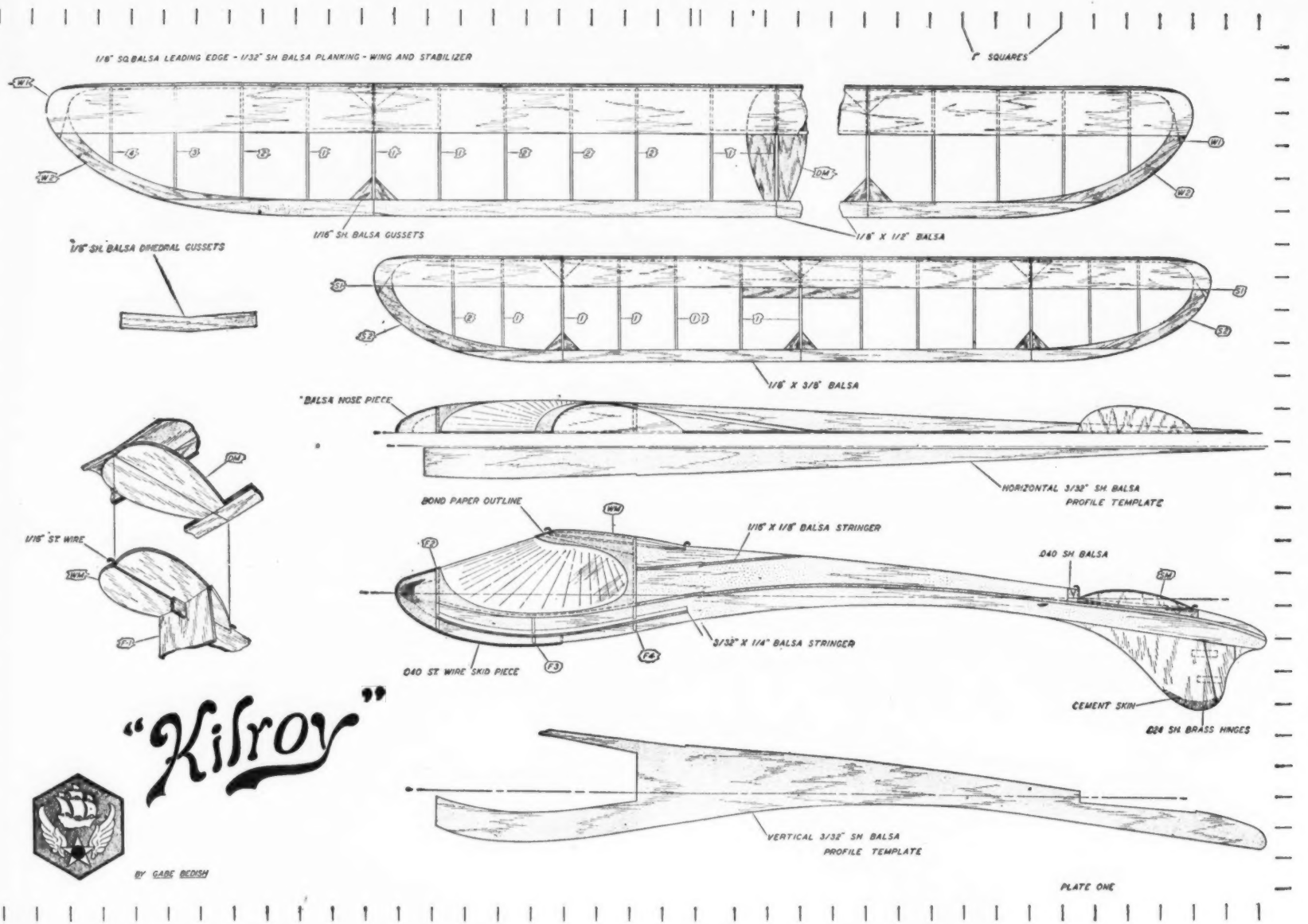
1-B-199	.199 engine with ball bearing crankshaft	18.50

ARDEN ACCESSORY PRICES

E-8030 SH	Improved Arden Glow Plug (short)	85c
E-8040 LH	Improved Arden Glow Plug (long)	85c
E-8035	Replaceable glow plug element (hot), 2 for	85c
E-8037	Replaceable glow plug element (cold), 2 for	85c
8015	Arden Glow Plug Adapter	25c
A-1350	Engine Exhaust Stacks for .099 engine	35c
B-2350	Engine Exhaust Stacks for .199 engine	45c
E-7002	Battery Connecting Cord Kit	35c

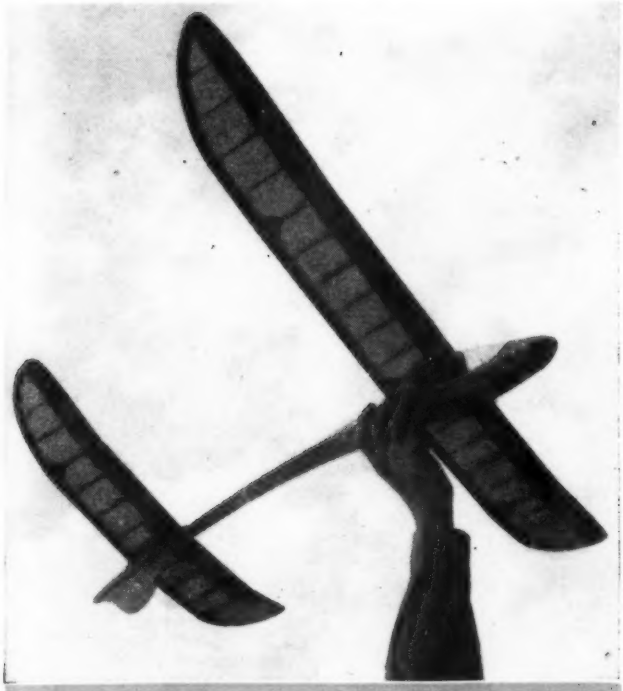
MICRO-BILT INCORPORATED · Danbury, Connecticut


1/8" SQ. BALSA LEADING EDGE - 1/32" SH. BALSA PLANKING - WING AND STABILIZER
1" SQUARES
1/16" SH. BALSA GUSSETS
1/8" X 1/8" BALSA
1/16" SH. BALSA DIHEDRAL GUSSETS
1/8" X 3/8" BALSA
BALSA NOSE PIECE
HORIZONTAL 3/32" SH. BALSA PROFILE TEMPLATE
BOND PAPER OUTLINE
1/16" X 1/8" BALSA STRINGER
1/16" ST. WIRE
.040 SH. BALSA
3/32" X 1/4" BALSA STRINGER
.040 ST. WIRE SKID PIECE
CEMENT SKIN
.024 SH. BRASS HINGES
VERTICAL 3/32" SH. BALSA PROFILE TEMPLATE

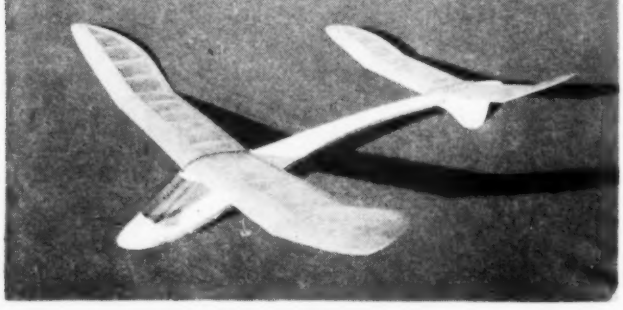
"Kilroy"

BY GABE REDISH

PLATE ONE



KILROY IS HERE!



by GABRIEL BEDISH

IF one outstanding character has evolved from the military service in the past conflict, none could have been more spectacular than "Kilroy"—a mythical figure that became one of our most widely known celebrities. An elusiveness on a par with the "Flying Dutchman" was one of "Kilroy's" most outstanding characteristics; and incidentally one also applicable to the model design presented here.

Our *Kilroy* of the towline glider world was thus christened after an exacting search for a title which would best represent the model's performing qualities. This model features a new departure in the field of glider design in the application of sound construction, effective streamlining and flight proficiency. From all the experience of glider design and flying in the past years, the most desirable features were gathered and are presented here in the most advantageous manner, contributing to a noteworthy performance.

The fuselage, from its highly streamlined nose through the fine delicate appearing after-section, is one of the strongest, most simply constructed and lightest weight structures yet developed. From front to rear it will be observed that every curve blends into the next following with the result that very little resistance is encountered in flight.

The sub-rudder was employed to provide a greater degree of directional stability and more effective control of the turn of the model. This, in conjunction with the rudder-vator type of stabilizer and the short coupled tail, produces an arrangement that is largely responsible for *Kilroy's* ability to latch on to the thermal train and stay there.

One of the most consistently weak points of most towline gliders, both structurally and aerodynamically, is the inefficient wing design and construction generally utilized. The importance of a well planned wing structure cannot be stressed too highly. By combining a high aspect ratio planform with a most effective glider airfoil (the Eiffel 400) and the ever outstanding poly-dihedral an efficient lift component is formed. The semi-planked construction not only increases strength but tends to preserve the airfoil contours as well.

It is commonplace to notice the number of weakly constructed wings used on models which many times appear almost to necessitate reclassifying the model in the ornithopter class. The flapping action usually terminates in a separated wing, and the remainder of the model ends up coming in much the same as a buzz bomb.

For the wing, dihedral at the preliminary break will be 1-1/2", while at the tip 3-1/2" is required. At the preliminary break in the rudder-vator 1" is needed; at the tip 4" will suffice.

Let's start the construction of what will be one of the most consistent performers you have ever built and flown, barring none. May *Kilroy* impart to you and your product his symbolic spirit!

CONSTRUCTION—Enlargement of the plans to full working size is greatly simplified by use of the full scale templates for the more complex components of the structure. The remainder is of such simplicity that no difficulty should be incurred in completing the enlargement. For the builder who desires the king-size variety of model, the scale may be altered to suit his tastes.

FUSELAGE—You will find this portion of the model one of the most easily assembled, strongest and lightest structures yet developed for such work. Essentially the unit is composed of three pieces of sheet balsa assembled with the aid of cement in a single operation.

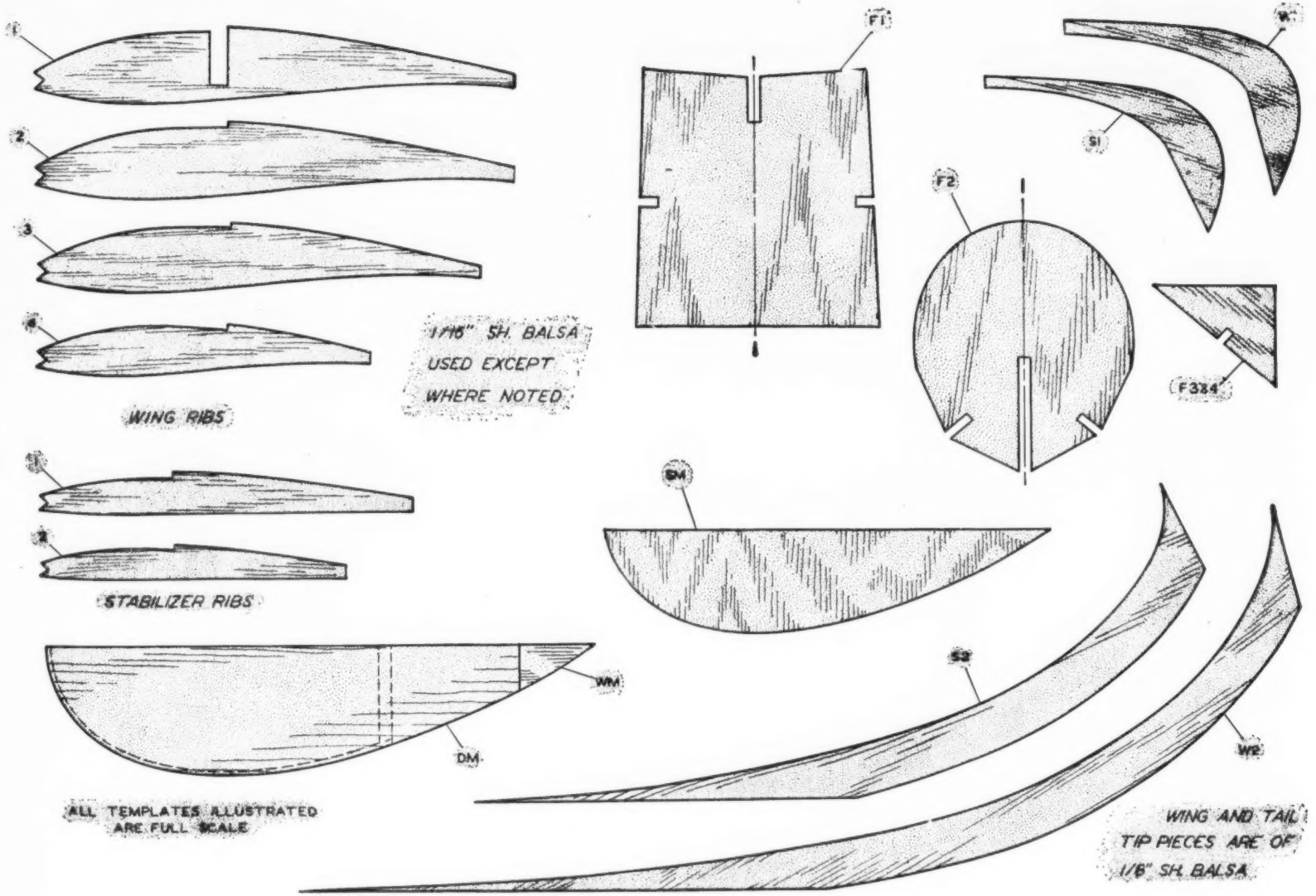
To do this, form the vertical balsa profile and the two horizontal fairing members from medium hard sheet balsa of proper thickness. Using a guide line prepared from the full size working plan, plot the path of the horizontal fairing pieces and attach them simultaneously with the aid of cement and pins. It will be seen that the simple curvature of the stringer imparts a large degree of strength that could not possibly be attained with conventional construction methods without an additional weight increase.

Now add the wing mount and its supporting formers along with the lower fairing formers. With the installation of the stringers, empennage mount and wing and tail retaining pins, the building operation is completed.

Note that the hard balsa nose piece has been hollowed out to act as a ballast box for the final balancing operation.

In preparation for covering this section, sandpaper carefully to insure a smooth job.

(*Turn to page* 41)


1
2
3
4
WING RIBS
1/16" SH. BALSA USED EXCEPT WHERE NOTED
F1
W
S1
F2
F324
5
6
STABILIZER RIBS
SM
WM
DM
S2
W2
ALL TEMPLATES ILLUSTRATED ARE FULL SCALE
WING AND TAIL TIP PIECES ARE OF 1/8" SH. BALSA

design forum

by CHARLES H. GRANT

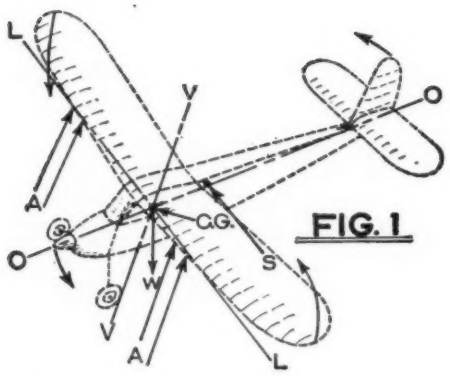


FIG. 1

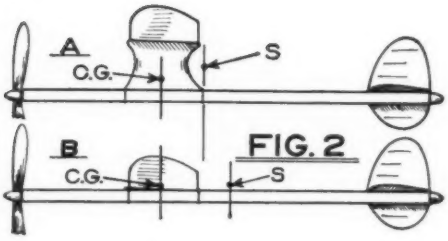


FIG. 2

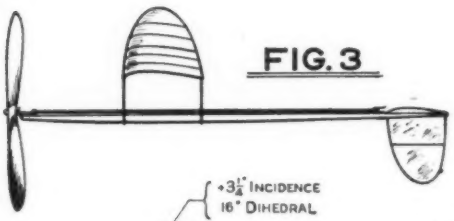


FIG. 3

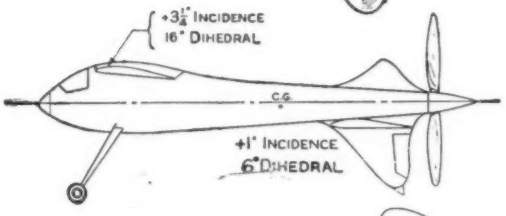
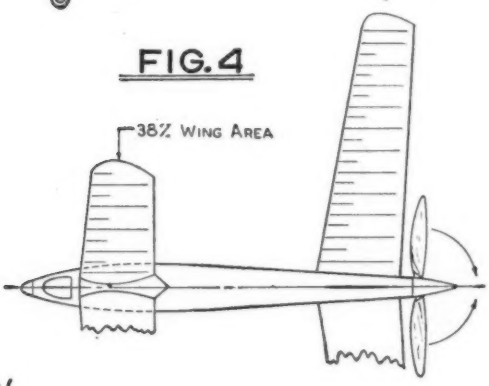


FIG. 4



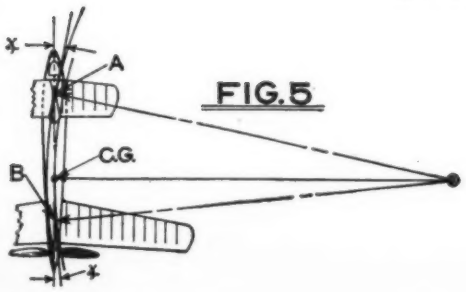


FIG. 5

THE fin of a model airplane seems to be a simple and unimportant fixture to many model builders: a part that completes the graceful contours instead of performing some useful vital function. Nothing could be further from the truth, for it lends value to all the other stability contributing features—for instance, to the dihedral with which it is linked closely.

Last month we discussed the effect of changing the area of the fin, assuming all other parts of the airplane had a fixed value. It was shown that the fin size affected direction of flight and degree of circling. A large fin makes a model circle to the left with the torque; with a very small fin this same model can be made to circle to the right. This characteristic has great bearing on the spiral stability of a model, which is the bugaboo of all model flyers.

Spiral stability is a combination of lateral, directional and longitudinal stability, or shall we say instability. These three types are respectively dependent upon rotation about the longitudinal axis (0-0) Fig 1, the vertical axis (V-V), and the lateral axis (L-L). If you have a combination of these rotations *from* normal flying attitude, you have spiral instability. This usually takes the form of a spiral dive, although it sometimes assumes the nature of a spiral climb. In the latter case, it cannot be classified as an unstable maneuver because it usually ends in a recovery to normal flight.

Let us see how the fin enters this problem. When a model circles, it may either side-slip or skid; this depends on speed, weight and various features of its design. Here we will assume the simplest condition: side-slip during a turn. When a model banks and turns under the influence of propeller torque at comparatively slow speed, gravity has a greater effect than the centrifugal force in the turn. Consequently the model, while banking, tends to slide in and down; the pull of gravity combined with centrifugal force acting at the center of gravity (CG). As it slides sideways there is an opposing force or pressure against the airplane due to air striking the plane, including all of its parts, at an angle to the longitudinal axis, Fig. 1. Here you see the force of gravity pulling downward, the airflow at an angle to the normal flying longitudinal axis, and an arrow indicating the resultant side pressure. This side pressure is the combination of increased lift on the lower wing due to the dihedral and pressures on the sides of the fuselage, fin and other parts.

This angular airflow also affects the higher wing, tending to push it down. The greater the dihedral angle the greater the lifting effect of the low wing and the pushing down effect of the high wing. The low wing lifts more because it presents a greater angle to the airflow than the high wing. This results from the angular approach of the airflow as indicated by arrow A, and this difference in angle at which the air strikes the wing is dependent upon the degree of dihedral. If the wing is absolutely straight with no dihedral, the air flows over both wings at the same angle. The greater the dihedral the greater will be the difference in attack angle between the low and high wing.

In this way, the dihedral creates a lateral roll about the longitudinal axis, the arrows on the wing indicate the direction of roll as the airplane side-slips downward. The airplane will recover its stability from this side-slipping effect and will not dive into the ground *provided* that recovery due to the lateral roll takes place quickly and before the nose drops to any appreciable extent. This is where the fin enters the problem.

Besides this lateral recovery roll, there is a simultaneous roll about the vertical axis. This is caused by the weight pulling down at CG and the side pressure pushing in the opposite direction to the rear of CG. This forms a couple which rotates the airplane about the vertical axis V-V, tending to nose it in toward the ground. You can readily see what will happen if there is no lateral recovery before this directional roll turns the nose down to a considerable degree. If only a directional roll takes place with no recovery lateral roll, the maneuver will result in a dive into the ground. However, if the airplane rolls laterally back into level flight before the nose drops to any appreciable degree, it will continue in stable flight. (*Turn to page* 45)

COWLING ON SPEED SHIPS IS STILL A MATTER OF WIDE DISCUSSION—HERE ARE MORE IDEAS

To Cowl Or Not To Cowl

The *Hornet* of Wayne Mathews has cowling as diagrammed in Fig. 4.

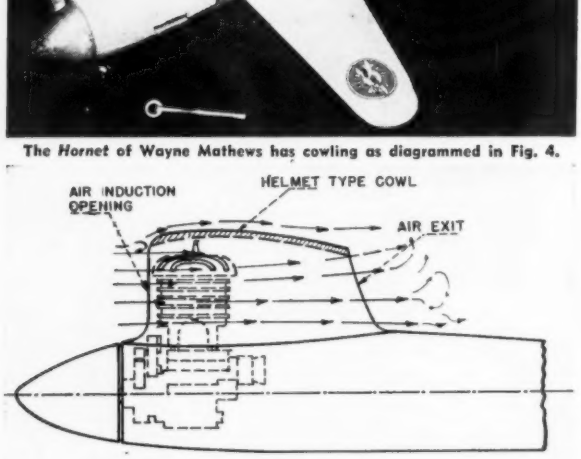


Fig. 1 This is the conventional helmet-type cowl

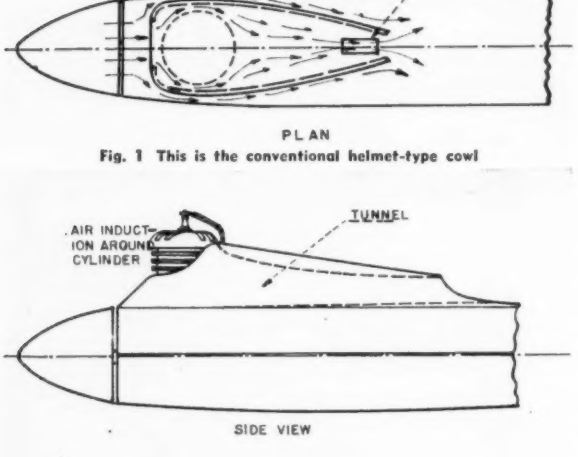


Fig. 2 Semi-closed cowl with cooling air venturi

GENERAL—A review of the current control line speed models reveals that about half the model designs have engine cowls compared to those that have partial or no cowl at all. It is therefore probable that some doubt exists in the minds of speed plane builders as to the intrinsic value of an engine cowl when compared to the additional construction complexities and the slight gain in additional weight or frontal area.

However, basic concepts of aerodynamics prove that properly cowling an engine cylinder will tend to reduce the parasitic drag considerably and that an exposed cylinder head will measurably increase the parasitic drag.

But the engine cowl, as all readers know, functions to improve the cooling of the engine, and by the reduction of drag and the dissipation of residual heat in the cylinder head, the engine will actually run cooler and develop a greater output of thrust horsepower when so cooled. If these two facts can be considered as axiomatic, then why are so many engines left uncowled? The reasons may be purely academic and for the purpose of simplicity, or it may be that some of the underlying theory concerning engine cowling has not been thoroughly explored by the control line fan who is seeking high performance.

TYPES OF ENGINE COWLING—There are several kinds of engine cowling currently employed by model builders:

(1) Conventional helmet type cowl. (See Fig. 1)
(2) Partial cowl. (Fig. 2)
(3) Pressure baffle helmet type cowl. (Fig. 3)
(4) Engine enclosed in fuselage with side exit openings. (Fig. 4)

ENGINE COWLING DESIGN—Disregarding the structural problems that must be solved, there are no empirical rules for cowl design. However, experience and experiment have led to certain general conclusions. For example, the flow of air through the cowl must be free enough to cool the engine properly; and it is the engine cooling requirements that determine the minimum limit on the size of the cowl's openings. Thus two advantages may be gained from the use of a cowl of any kind. Two more advantages are the reduction in parasitic drag and also the protection of the engine from foreign material.

The geometrical proportions of the cowl should be governed by the size of the engine. In the planform, the cowl should at least present the minimum of drag by following the lines of the fuselage or assuming a streamline plan form. In the vertical plane, the cowl may have the uppersurface conform to a general streamline similar to the uppersurface of an airfoil.

Engine cooling will be materially improved, and the mass flow of air required through the cowling reduced, by the installation of baffles to direct all the air that is inducted into the cowl into intimate contact with the cylinder head. An optimum form of baffle is one that surrounds the cylinder for a considerable part of the circumference, and is placed not more than 1/16" from the cooling fins on the cylinder. The air should be blocked as completely as possible in order to prevent air leakage through the space between baffle and cylinder. As is to be expected, the total mass flow of air through such a cowl is greatly reduced, but the cooling efficiency and reduction in parasitic drag are both improved. The air will be directed over the cylinder at a higher velocity because of the reduction in pressure aft of the cylinder and will thus conduct away the heat of the engine at a higher rate of cooling.

At air speeds below 130 mph, approximately 30% of the air flows through the cowl, the rest flows around and over it. Thus it is important that the planform and vertical plane projections of the cowl conform with general streamlining practice. At air speeds greater than 130 mph, possibly not more than 15 to 20% of the air flows through the cowl. A

by Willis L. Nye

well designed helmet type cowl will reduce the overall drag presented by an exposed cylinder at least 30%, provided it is designed along the lines discussed in this article. NACA technical reports substantiate this contention. (See Fig. 5)

FORM DRAG—That part of the model's total drag caused by the size of the engine and the external configuration of the cowl is called the external or the form drag. The rest of the drag is known as the internal or cooling drag. This latter is caused by air flowing through the cowling and over the engine; this air is considerably disrupted by the irregular form of the engine. In general, form drag may be considered as the increase in drag of the complete model over that of a theoretically streamlined form of the same projected frontal area; or it may also be defined as the increase in drag of the complete installation of a theoretically streamlined solid of revolution but of a lesser projected frontal area. Any increment in drag caused by an increase in the fuselage projected frontal area by the addition of a cowl can be charged to the engine. However, this increase is not so large as may be expected because the drag of the fuselage increases less rapidly than the frontal area, it being more nearly proportional to the total surface area of the fuselage and wing. And something else to consider is the fact that a certain percentage of available engine H.P. is required to overcome cooling drag whether the engine is cowled or uncowled. Therefore, reduction in the cooling drag by proper cowling and baffling of the engine will certainly result in a better thrust effort.

COOLING DRAG—The engine power loss in cooling the engine is known as the cooling drag. Mathematically, this may be approximated as follows:

$$\text{COOLING H.P.}_{\text{(req'd)}} = \frac{P \times Q}{33{,}000}$$

where P equals the pressure drop in pounds per square foot, and Q is the volume of air flowing in cubic feet per minute.

In analyzing this equation it is evident that the cooling H.P. loss increases rapidly as the volume of cooling air supplied is increased. As with all mechanical devices, a certain percentage of loss is expected, but by proper design of the engine cowl this loss may be reduced to not more than 10% at the worst condition.

Because of the increase in the cooling H.P. loss as a function of the volume of air flowing over the cylinder, it is evident that a minimum of air at high velocity will result in a material reduction in the H.P. loss. By means of pressure baffles, this is possible. This contention is proved by wind tunnel experiments which show that when the pressure drop is kept to a minimum amount, the cooling H.P. loss will not be of major importance, provided proper baffles and ducting are employed. In addition, it is possible to regain some of this loss at speeds above 130 mph, by utilizing the heat energy and ram jet effect as it flows over the engine.

However, where pressure baffle helmet type cowls are used, certain engines may tend to heat excessively because of the lack of volume of air flowing over the cylinder heads during ground operation. Prolonged operation during warm sultry weather and high humidity may cause the piston to seize if the lubrication is not sufficient.

COOLING AVAILABLE—When pressure baffles are installed around the cylinder head, the pressure drop developed is a function of the translational speed of the model. The dynamic pressure created by the translational speed is converted into static pressure at the front part of the cowling. Fig. 5 shows the theoretical pressure distribution about an engine cowl. The region of positive pressure, it should be noted, extends over the opening in front of the cowl. A negative region of pressure extends from the aft 3/4 length of the cowling. It is well to remember that propeller slipstream has little effect on engine cooling except on the ground and during the initial takeoff run from the dolly and climb to cruising altitude. Another factor to remember in design is that the trailing edge of the prop blades should be located so there is not more than 1/16" to 3/32" clearance from the air induction opening of the engine cowl. When this is greater than specified, the air flow about the cowl may be disrupted and cause a large leakage with subsequent increase in cooling drag and engine heat loss.

INDUCTION AND EDUCTION OPENING AREAS IN ENGINE COWLS—For simplicity of design, the induction opening area (inlet) and the eduction opening area (outlet) should be approximately equal. However, this is not entirely empirical, and best results can only be obtained by experimenting. Computing the area for induction is a complex problem. Its solution involves factors of frontal engine projected area, determination of the drop in static pressure because of baffling, the drop in static pressure across the exit opening, and the

(*Turn to page* 56)

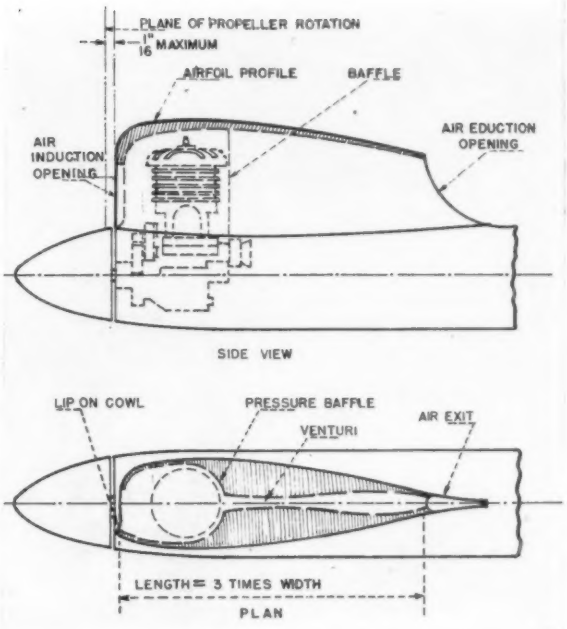


Fig. 3 Improvements over Fig. 2 give greater cooling and more streamlining

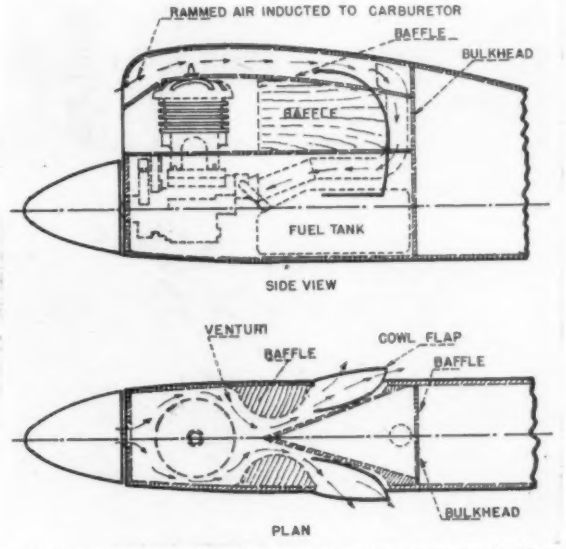


Fig. 4 Separate air ducts for carburetor and cooling air are provided here

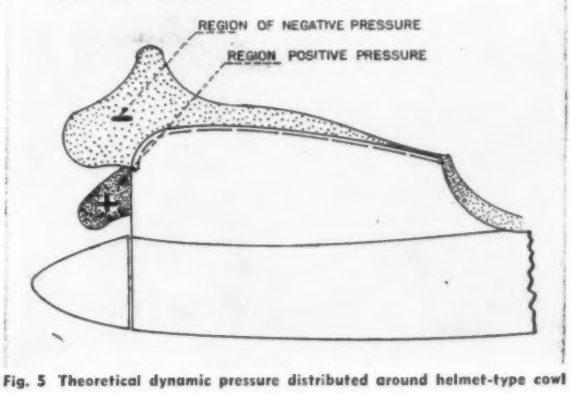
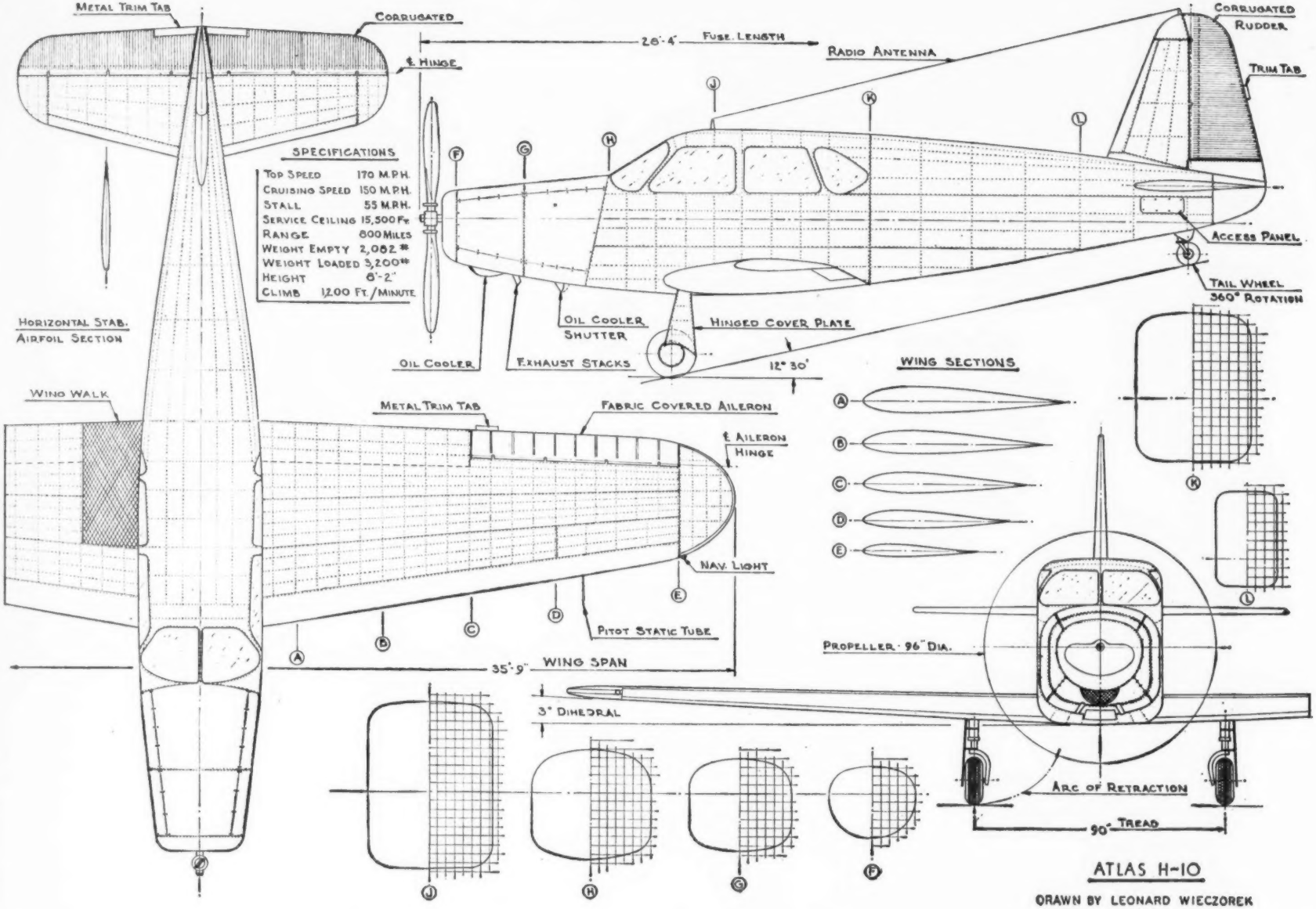


Fig. 5 Theoretical dynamic pressure distributed around helmet-type cowl



ATLAS H-10

DRAWN BY LEONARD WIECZOREK

FOUR FOR TWO

by Robert McLarren

FOUR PLACE ATLAS H-10, AT $2995, COSTS LESS THAN SOME TWO-PLACERS

TAKE four people, fly them along at 150 mph for 800 miles and offer to sell them the airplane in which they're riding for just $2995—you've either got a philanthropist or the nation's smartest aircraft manufacturer! Whether Max B. Harlow is one or the other remains to be seen, but that is exactly what he proposes to do with his new H-10 aircraft.

Wise heads are shaking, engineers are dubious and John Q. Public is reaching for his checkbook because that price tag puts this new airplane just $1000 *under* the next four-place personal aircraft available, and something like $7000 under the more popular all metal four-place designs. Many engineers and production experts have insisted that engineering simplicity, and tight economy can produce private aircraft far cheaper than has been known heretofore, but only Max Harlow and his staff have ever proposed anything like this!

But the Atlas H-10 is far more that a dream airplane resting in the doodles of a sketch pad. The prototype is actually flying and has been for several months. Tooling is being designed and built and quantity production is already definitely scheduled. This is an airplane in being, not the "hot air" designs offered for sale after V-J Day when fantastic production figures were proposed and everybody was going to own his own airplane.

Max Harlow has been in the business for more years than he will readily admit and there is no question regarding his hard headed realism when it comes to airplane design and construction. As instructor at Pasadena Junior College (Calif.) he assisted his class in the design of a four-place, low cost personal aircraft in 1938 that looked like more than just another classroom project when it was completed. The design data indicated the craft could cruise at 135 mph on 145 hp, and that looked too good to roll up and stow away in the gathering collection of senior student projects. Harlow showed the design to some of his business acquaintances and the following year the Harlow Aircraft Co. was formed. Manufacturing space was secured at the (then) idle Alhambra Airport in the Los Angeles suburbs. In honor of the class, the airplane was designated the PJC-1 and subsequent modifications produced the PJC-2 which went into production.

One of the early all metal personal aircraft, the PJC-2 weighed only 1700 lbs. empty and could carry a useful load of 900 lbs., which wasn't bad for a plane of its size (the useful load percentage of gross weight usually rises with airplane size, the huge Convair B-36A lifting more than its own empty weight!). Powered by a Warner *Super Scarab* 50-A of 145 hp, the little craft displayed a top speed of 150 mph, a 660 ft. per min. rate-of-climb, and a 500 mile range.

Commercial production was getting underway on the PJC-2 when Harlow foresaw the future military possibilities of the design as a training plane. Air Force design proposals for all types of trainers were being circulated and speed was emphasized. Rather than spend the time and money for developing an entirely new airplane, Harlow engineers redesigned the PJC-2 as a two-seat training plane. This required a redesigned fuselage, thinner than the original and equipped with dual controls. A more powerful Warner *Super Scarab* 165 hp engine was selected and a Hamilton Standard constant speed propeller installed. The resulting trainer weighed 2015 lbs. empty with a 585 lb. useful load; but the additional power increased the top speed to 163 mph and the cruising speed to 135 mph.

Then a strange series of events began to take place in a far corner of the world that linked the new trainer with the war. William D. Pawley, wealthy New York aviation exporter, foresaw the possibilities of aircraft manufacture in India, a spot remote from the battlefronts, where labor was plentiful and where aircraft manufacture was badly needed. So thinking, he formed Hindustan Aircraft Ltd. in 1940 and was able to purchase and ship to India quantities of machine tools before they became worth their weight in gold in the U.S. war effort the following year. Pawley enlisted the aid of Indian

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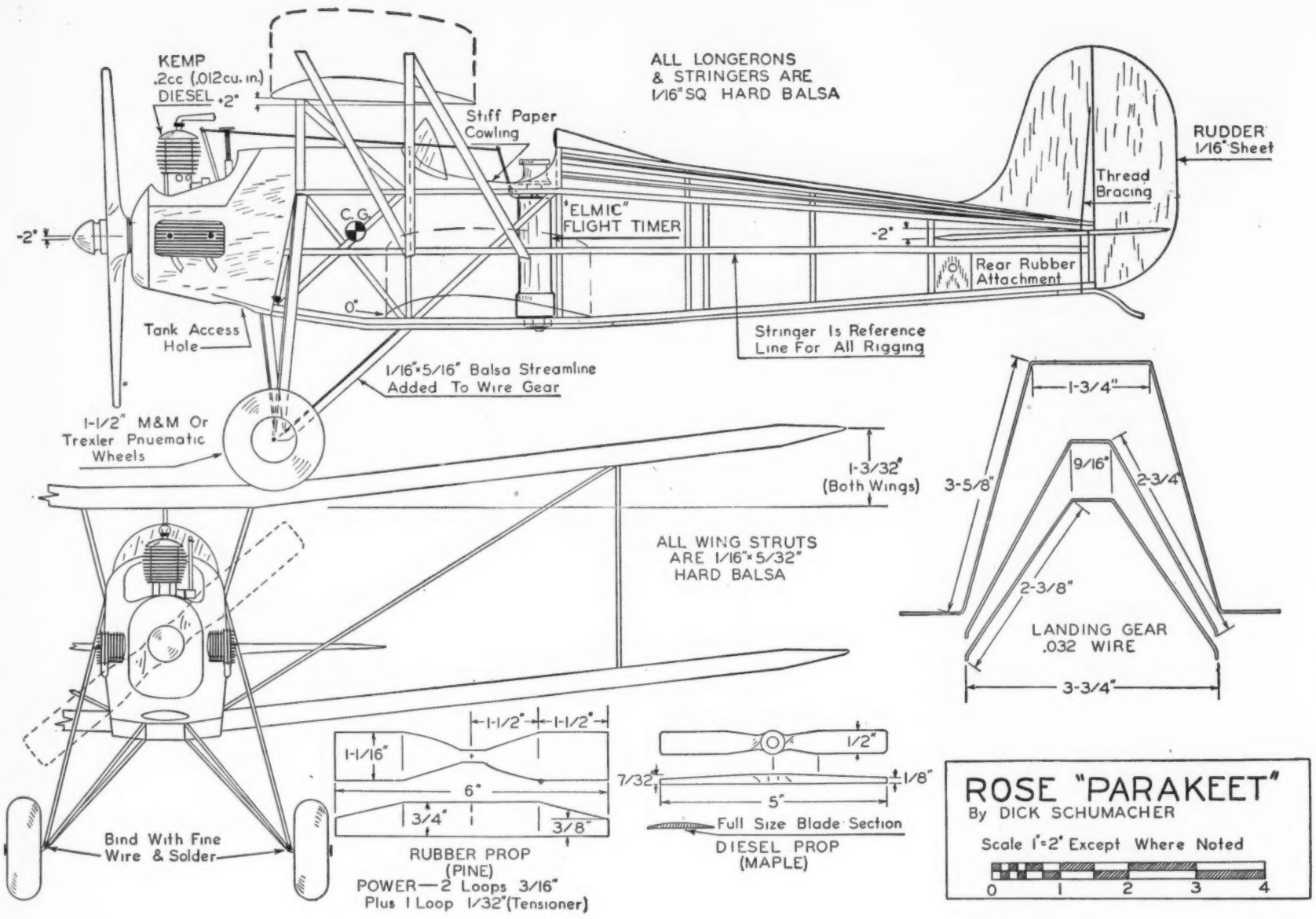

ROSE "PARAKEET"

By DICK SCHUMACHER

Scale 1"=2" Except Where Noted

0 1 2 3 4

The Parakeet is just right for the tiny diesel engines

The powerplant contrasted with a standard ignition battery

Model Parakeet

A built-up tail was used on the original rubber version

by Dick Schumacher

USABLE WITH RUBBER, CO2 OR DIESEL POWER THIS ATTRACTIVE MODEL SHOULD INTEREST ALL BUILDERS

The model looks much sleeker without this big rubber prop

WHAT modeler hasn't completed a little flying scale job and sat back to daydream about the possibilities of having an internal combustion engine small enough to power it? Our tiny *Parakeet* was first completed as a rubber powered flying scale, and the fulfillment of the dream was the result of exchanging info with Mick Farthing, one of England's outstanding "light weight" experts.

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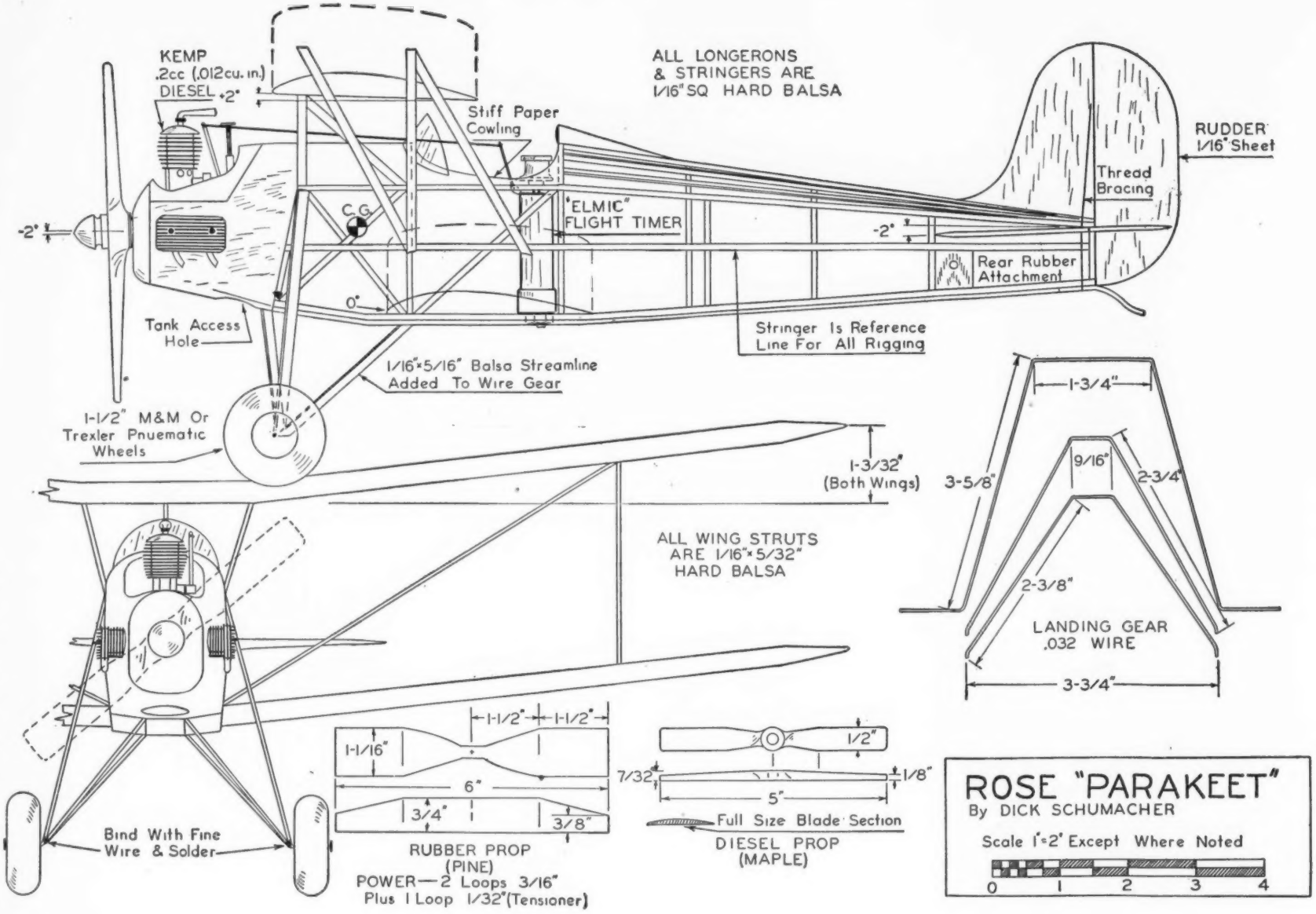
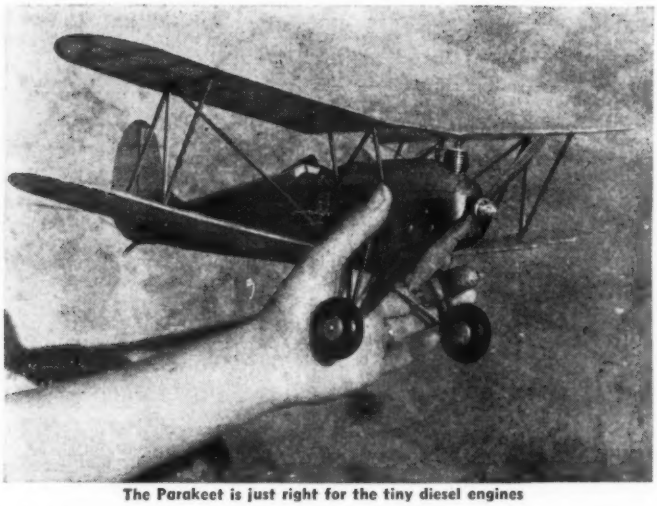
(*Turn to page* 54)


KEMP
.2cc (.012cu. in.)
DIESEL +2°
Stiff Paper
Cowling
ALL LONGERONS
& STRINGERS ARE
1/16" SQ HARD BALSA
RUDDER
1/16" Sheet
Thread
Bracing
C.G.
"ELMIC"
FLIGHT TIMER
-2°
-2°
Rear Rubber
Attachment
0°
Tank Access
Hole
Stringer Is Reference
Line For All Rigging
1/16"×5/16" Balsa Streamline
Added To Wire Gear
1-1/2" M&M Or
Trexler Pnuematic
Wheels
1-3/32"
(Both Wings)
ALL WING STRUTS
ARE 1/16"×5/32"
HARD BALSA
1-3/4"
3-5/8"
9/16"
2-3/4"
2-3/8"
LANDING GEAR
.032 WIRE
3-3/4"
1-1/2"
1-1/2"
1-1/16"
6"
3/4"
3/8"
Bind With Fine
Wire & Solder
RUBBER PROP
(PINE)
POWER—2 Loops 3/16"
Plus 1 Loop 1/32"(Tensioner)
1/2"
7/32"
1/8"
5"
Full Size Blade Section
DIESEL PROP
(MAPLE)
ROSE "PARAKEET"
By DICK SCHUMACHER
Scale 1"=2" Except Where Noted
0
1
2
3
4



The Parakeet is just right for the tiny diesel engines

The powerplant contrasted with a standard ignition battery

Model Parakeet

A built-up tail was used on the original rubber version

by Dick Schumacher

USABLE WITH RUBBER, CO2 OR DIESEL POWER THIS ATTRACTIVE MODEL SHOULD INTEREST ALL BUILDERS

The model looks much sleeker without this big rubber prop

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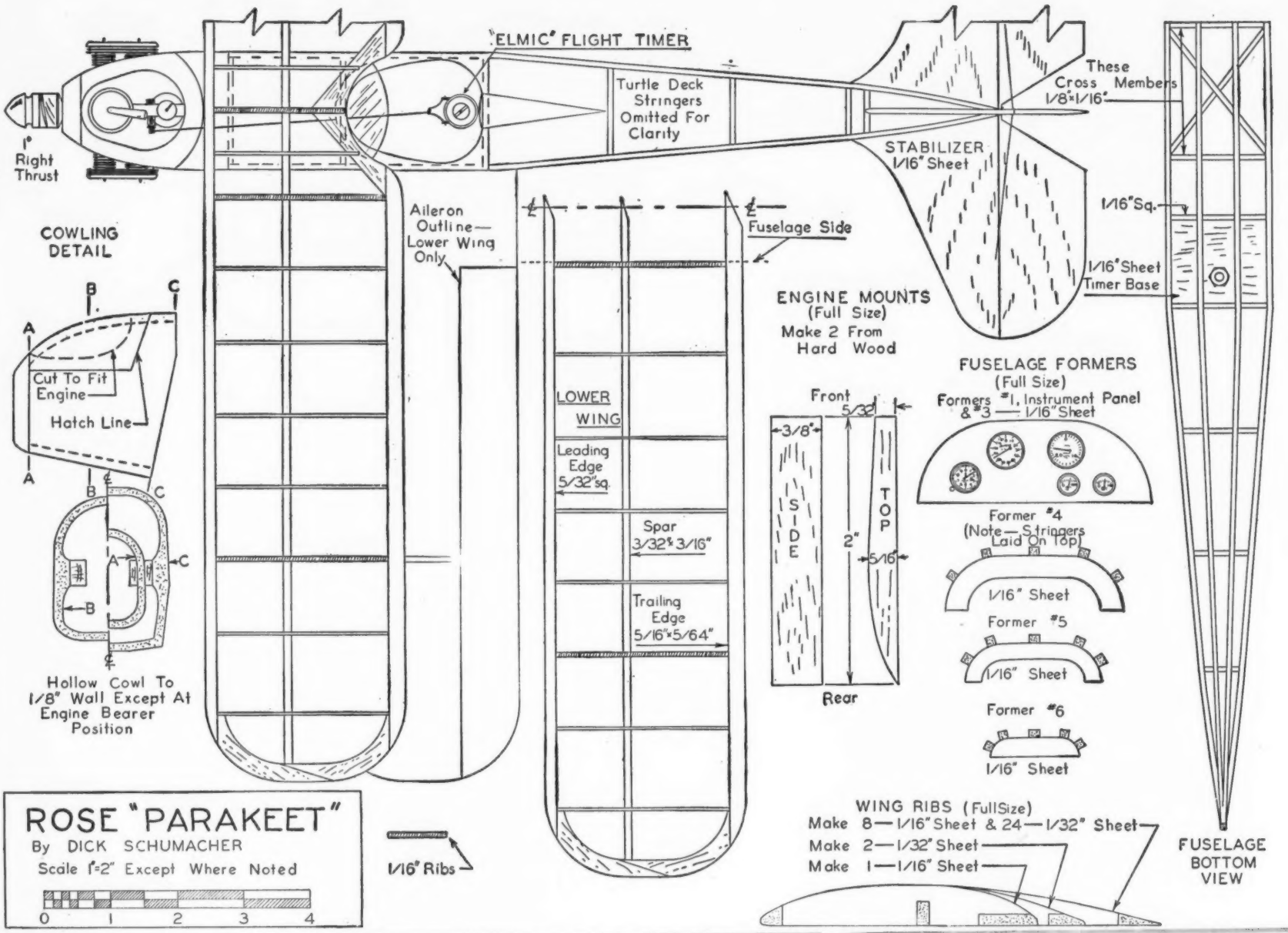
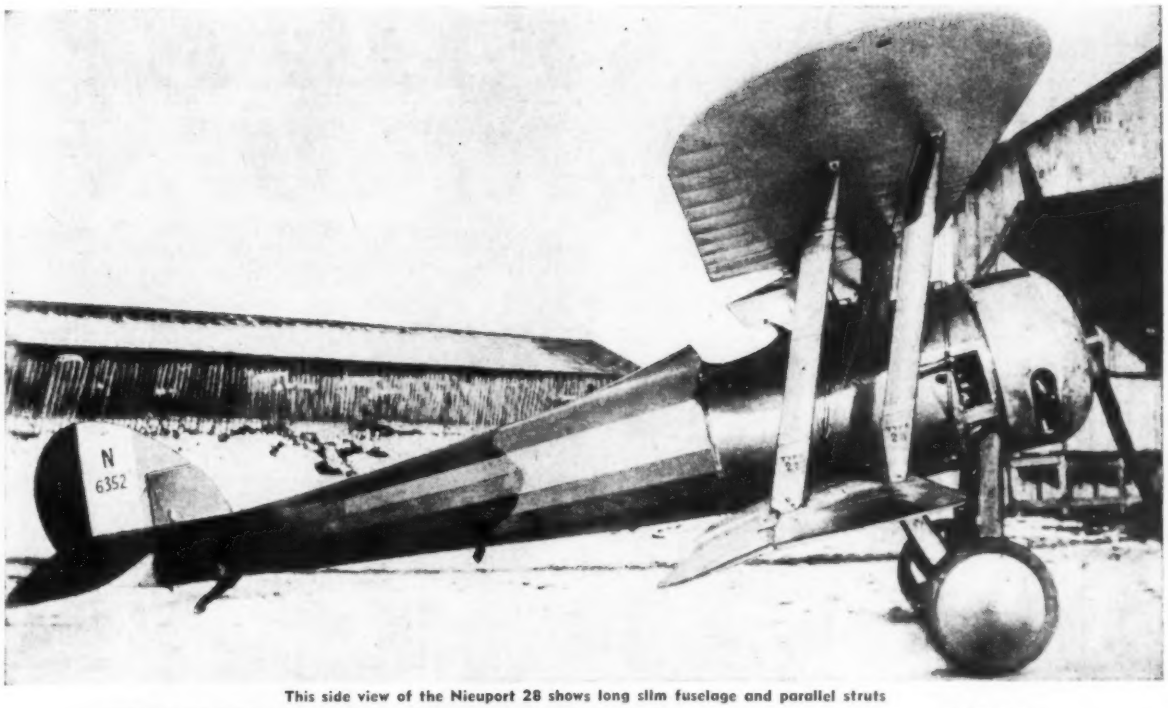


ROSE "PARAKEET"

By DICK SCHUMACHER

Scale 1"=2" Except Where Noted

0 1 2 3 4



This side view of the Nieuport 28 shows long slim fuselage and parallel struts

WORLD WAR I

by ROBERT C. HARE

PART I

Lineup of 28's with 94th Pursuit Squadron of the A. E. F.

American Nieuport 28's returning from a patrol at Toul, France

WHEN the United States entered World War I in April 1917, there began in this country a feverish activity of production the likes of which had never been seen here. One of the most affected industries was aviation, at that time a pitifully undernourished, undermanned and totally inadequate segment of American force.

Compared to what the Europeans had developed during their 2½ years of war, American airpower was absolutely nonexistent. To develop an aerial fighting force, however, meant more than just an industry capable of rapid expansion for a specific need—it meant men to operate whatever was produced, men to maintain what was produced, and men to produce the raw materials from which a 1917-18 air force was built.

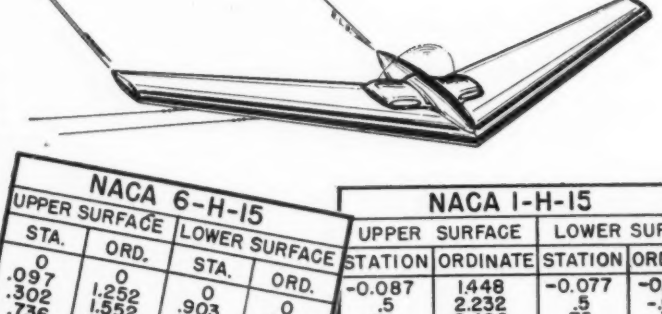
Fortunately in a way, American aviation at that time was in a good position to provide men to fly aircraft. Several good training types had been developed here that were simple to build and up to date—as trainers. In a short time production of such ships as the Curtiss JN-4, Standard H-3 and J-1 was under way and American Air Power was hatched.

Up to the time we entered W. W. I our aircraft industry had been kept in the dark about details of European aircraft. After all, we had been neutral, and as neutrals were in direct contact with both warring sides. But when we threw our support to the Allied nations we automatically gained access to, and know-how of, the very best in military aircraft. And with it we gained the rights to build the DeH-4 in America—the very latest two place fighter in the Allied stables.

That took care of one segment of airpower. How about pursuits? We had largely been building trainers, and the DeH-4 was in a way just a beefed up high-powered trainer. But as far as the delicately built, high-powered and tricky

(*Turn to page* 48)

STABLE AIRFOILS



NACA 23015

UPPER SURFACE		LOWER SURFACE	
STA.	ORD.	STA.	ORD.
0	—	0	0
1.25	3.34	1.25	-1.54
2.5	4.44	2.5	-2.25
5	5.89	5	-3.04
7.5	6.90	7.5	-3.61
10	7.64	10	-4.09
15	8.52	15	-4.84
20	8.92	20	-5.41
25	9.08	25	-5.78
30	9.05	30	-5.96
40	8.59	40	-5.92
50	7.74	50	-5.50
60	6.61	60	-4.81
70	5.25	70	-3.91
80	3.73	80	-2.83
90	2.04	90	-1.59
95	1.12	95	-.90
100	.16	100	-.16
100	—	100	0

NACA 4-H-12.4

UPPER SURFACE		LOWER SURFACE	
STA.	ORD.	STA.	ORD.
-0.072	1.207	-0.064	-0.035
.417	1.860	.417	-.546
.625	2.073	.625	-.616
1.042	2.442	1.042	-.739
2.083	3.178	2.083	-.934
4.167	4.314	4.167	-1.087
6.250	5.254	6.250	-1.139
8.333	6.063	8.333	-1.167
12.500	7.430	12.500	-1.198
16.667	8.556	16.667	-1.211
20.833	9.469	20.833	-1.215
25.000	10.181	25.000	-1.226
29.167	10.692	29.167	-1.264
33.333	10.972	33.333	-1.304
37.500	11.036	37.500	-1.350
41.667	10.848	41.667	-1.399
45.833	10.357	45.833	-1.434
50.000	9.549	50.000	-1.417
54.167	8.394	54.167	-1.472
58.333	7.150	58.333	-1.468
62.500	5.933	62.500	-1.450
66.667	4.800	66.677	-1.433
70.833	3.750	70.833	-1.392
75.000	2.808	75.000	-1.333
79.167	1.983	79.167	-1.233
83.333	1.300	83.333	-1.083
87.500	.733	87.500	-.900
91.667	.325	91.667	-.658
95.833	.083	95.833	.358
100.000	0	100.000	0

NACA 6-H-15

UPPER SURFACE		LOWER SURFACE	
STA.	ORD.	STA.	ORD.
0	0	0	0
.097	1.252	.903	-.788
.302	1.552	1.198	-.896
.736	2.068	1.764	-1.064
1.889	3.090	3.111	-1.334
4.300	4.647	5.700	-1.659
6.768	5.878	8.232	-1.872
9.267	6.919	10.733	-2.023
14.317	8.575	15.683	-2.251
19.414	9.855	20.586	-2.417
24.546	10.796	25.454	-2.550
29.706	11.468	30.294	-2.676
34.895	11.883	35.105	-2.817
40.121	12.017	39.879	-2.947
45.392	11.834	44.608	-3.116
50.855	11.168	49.145	-3.310
56.020	10.084	53.980	-3.582
61.035	8.794	58.965	-3.872
65.943	7.343	64.057	-4.085
70.772	5.848	69.228	-4.184
75.538	4.374	74.462	-4.118
80.211	2.996	79.789	-3.762
84.994	1.865	85.006	-2.931
89.957	.980	90.043	-1.798
94.977	.322	95.023	-.706
100.000	0	100.000	0
L.E. RADIUS		1.42	

NACA 1-H-15

UPPER SURFACE		LOWER SURFACE	
STATION	ORDINATE	STATION	ORDINATE
-0.087	1.448	-0.077	-0.042
.5	2.232	.5	-.655
.75	2.488	.75	-.739
1.25	2.931	1.25	-.887
2.5	3.813	2.5	-1.121
5.0	5.177	5.0	-1.304
7.5	6.305	7.5	-1.367
10	7.276	10	-1.400
15	8.916	15	-1.437
20	10.267	20	-1.453
25	11.363	25	-1.458
30	12.217	30	-1.483
35	12.831	35	-1.517
40	13.166	40	-1.565
45	13.243	45	-1.620
50	13.017	50	-1.679
55	12.428	55	-1.721
60	11.459	60	-1.754
65	10.073	65	-1.766
70	8.272	70	-1.761
75	6.151	75	-1.717
80	3.987	80	-1.614
85	2.031	85	-1.460
90	.538	90	-1.200
95	-.261	95	.797
100	0	100	0

NACA 2-H-15

UPPER SURFACE		LOWER SURFACE	
STA.	ORD.	STA.	ORD.
-0.087	1.448	-0.077	-0.042
.5	2.232	.5	-.655
.75	2.488	.75	-.739
1.25	2.931	1.25	-.887
2.5	3.813	2.5	-1.121
5.0	5.177	5.0	-1.304
7.5	6.305	7.5	-1.367
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15	8.916	15	-1.437
20	10.267	20	-1.453
25	11.363	25	-1.458
30	12.217	30	-1.483
35	12.831	35	-1.517
40	13.166	40	-1.565
45	13.243	45	-1.620
50	13.017	50	-1.679
55	12.428	55	-1.721
60	11.459	60	-1.754
65	10.073	65	-1.766
70	8.340	70	-1.660
75	6.420	75	-1.470
80	4.650	80	-1.160
85	3.280	85	-.710
90	2.370	90	-.090
95	1.870	95	.730
100	1.750	100	1.750

NACA 3-H-13.5

UPPER SURFACE		LOWER SURFACE	
STATION	ORDINATE	STATION	ORDINATE
-0.079	1.316	-0.070	-0.038
.454	2.029	.454	-.595
.682	2.262	.682	-.672
1.136	2.665	1.136	-.806
2.273	3.466	2.273	-1.019
4.546	4.706	4.546	-1.185
6.818	5.732	6.818	-1.243
9.091	6.615	9.091	-1.273
13.636	8.105	13.636	-1.306
18.182	9.334	18.182	-1.321
22.727	10.330	22.727	-1.325
27.273	11.106	27.273	-1.348
31.818	11.664	31.818	-1.379
36.364	11.969	36.364	-1.423
40.909	12.039	40.909	-1.473
45.454	11.834	45.454	-1.526
50.000	11.298	50.000	-1.565
54.546	10.417	54.546	-1.595
59.091	9.157	59.091	-1.605
63.636	7.727	63.636	-1.601
68.182	6.309	68.182	-1.561
72.727	4.955	72.727	-1.467
77.273	3.782	77.273	-1.264
81.818	2.873	81.818	-.991
86.364	2.282	86.364	-.564
90.909	1.873	90.909	0
95.454	1.655	95.454	.718
100.000	1.591	100.000	1.591

NACA 5-H-15

UPPER SURFACE		LOWER SURFACE	
STA.	ORD.	STA.	ORD.
0	0	0	0
.192	1.225	.808	-.881
.409	1.501	1.091	-1.015
.861	1.973	1.639	-1.229
2.040	2.899	2.960	-1.599
4.476	4.294	5.524	-2.080
6.953	5.390	8.047	-2.422
9.454	6.311	10.546	-2.685
14.492	7.774	15.508	-3.090
19.565	8.904	20.435	-3.394
24.663	9.734	25.337	-3.626
29.782	10.331	30.218	-3.819
34.922	10.709	35.078	-3.993
40.090	10.841	39.910	-4.123
45.291	10.708	44.709	-4.250
50.535	10.171	49.365	-4.351
55.759	9.275	54.241	-4.459
60.772	8.193	59.228	-4.547
65.703	6.955	64.297	-4.541
70.575	5.658	69.425	-4.426
75.400	4.356	74.600	-4.166
80.157	3.098	79.843	-3.666
84.996	2.003	85.004	-2.793
89.968	1.087	90.032	-1.693
94.983	.372	95.017	-.656
100.000	0	100.000	0
L. E. RADIUS: 1.42			

By Robert L. Brown

IN designing a model flying wing, all available means are used to reduce the pitching moments. Piloted aircraft of large size, operating at high Reynold's Numbers, have less trouble maintaining longitudinal stability than do models. Adding to this inherent problem of flying wings is "outflow" or third-dimensional flow which induces a quicker stall at the tip.

This undesirable condition may be reduced by building in a lower angle at the tip than at the root (wash-in). The angular difference may be as high as 6 or 8 degrees, even in man-carrying soarers. Of course the total drag increases as this differential angle between root and tip increases, but if you are concerned primarily with longitudinal stability, as in the case of free-flight models, this practice should be followed. Also, at high angles of attack the "swept" wing has an effective cathedral (negative dihedral) that reduces lateral stability.

A series of NACA laminar-flow airfoils with little or no pitching moment are presented here. They were designed originally for helicopter rotors but should find enthusiastic users in the model field. To obtain airfoils of any percentage thickness (t/c value) multiply the ordinates by any desired correction factor such as .60, .80, 1.3 etc. For further information refer to booklet CB No. 3113, an NACA unclassified report which was confidential during the war.

With sections having pitching-moment coefficients close to zero, maximum lift-drag ratios were attained that were almost twice as great as those of the NACA 230 series. These extremely high lift-drag ratios are always sought by the model airplane designer. These new sections, however, are unduly sensitive to roughness or "hills and dales." Therefore extreme care should be exercised in designing the wing structure to eliminate deviations from the true airfoil shape.

Of the conventional airfoil sections developed previously by NACA, the 230 series gave the highest lift-drag ratios with small pitching moments. It seemed likely that even higher lift-drag ratios could be attained, while maintaining zero pitching moment, by designing the airfoils to keep extensive laminar boundary layers in the design range of lift coefficients.

Designations NACA 1-H-15, NACA 2-H-15, NACA 3-H-13.5, NACA 4-H-12.4, NACA 5-H-15, and NACA 6-H-15 of the newly developed airfoils are considered temporary pending development of a more descriptive system of designation. The first number is merely a serial number to identify the airfoil. H means the airfoils were developed for use on rotating-wing aircraft. The last two numbers give thickness ratio of the airfoil (t/c) in percentage of chord.

NACA 1-H-15 airfoil was the original low-drag section used in derivation of the NACA 2-H-15, NACA 3-H-13.5, and NACA 4-H-12.4 sections. In order to reduce the pitching moment, the trailing edge or tail was swept up, resulting in the NACA 2-H-15 section. The pitching moment was still quite high. A tail extension was therefore added and the upsweep at the tail was slightly changed, resulting in the NACA 3-H-13.5.

Finally, in an effort to increase the maximum lift-drag ratio the upsweep at the tail was removed and a longer tail extension used, resulting in NACA 4-H-12.4. The NACA 5-H-15 and 6-H-15 airfoils have the same thickness distribution and the same type of mean line, but the NACA 6-H-15 has 35% more camber than the NACA 5-H-15.

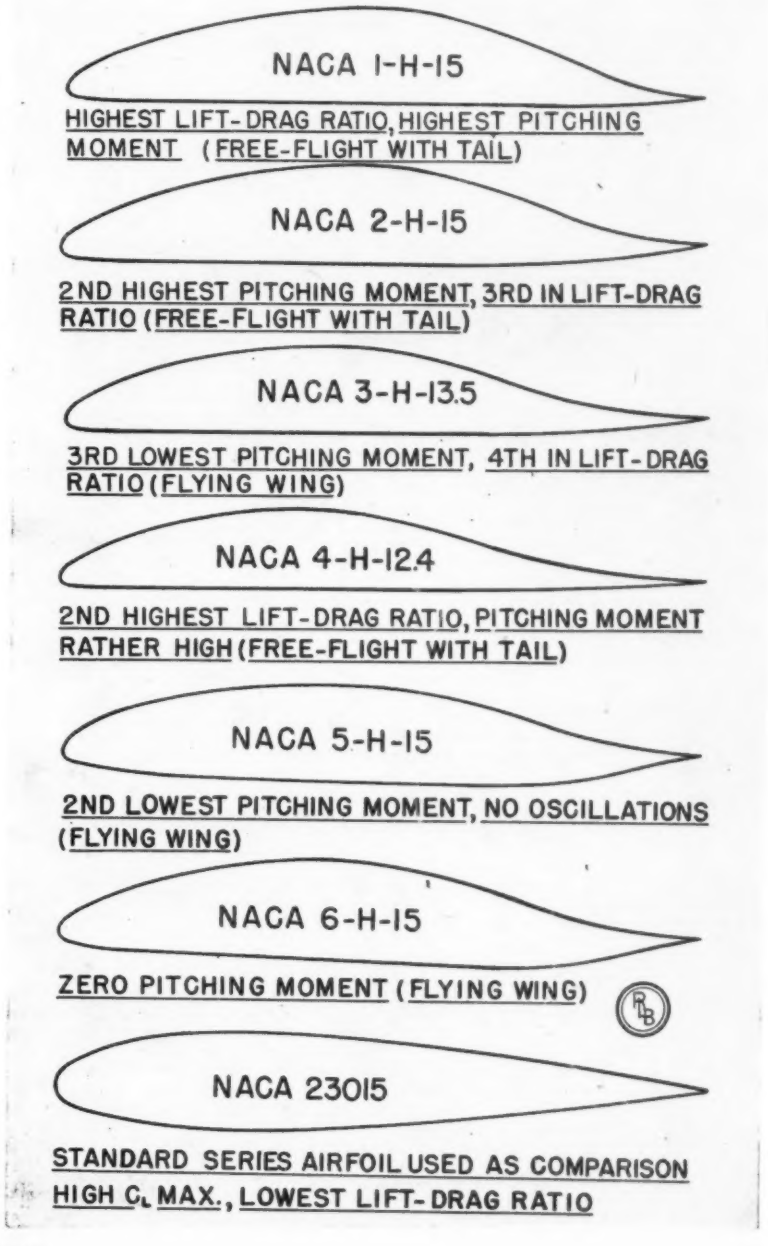
Since these airfoils were not recorded in a completely formal manner, you will find the leading edge radius and slope missing on some of them, and the most forward station ahead of the zero station (a minus value) on others. This increment increases your design chord but slightly. Also, the usual stations have been changed in some of the airfoils. These odd station positions make airfoil plotting so laborious that it would be advisable for the model builder to plot one airfoil of 10" chord, locate the stations given in standard tables, and make up a new table of ordinates measured in hundredths of an inch.

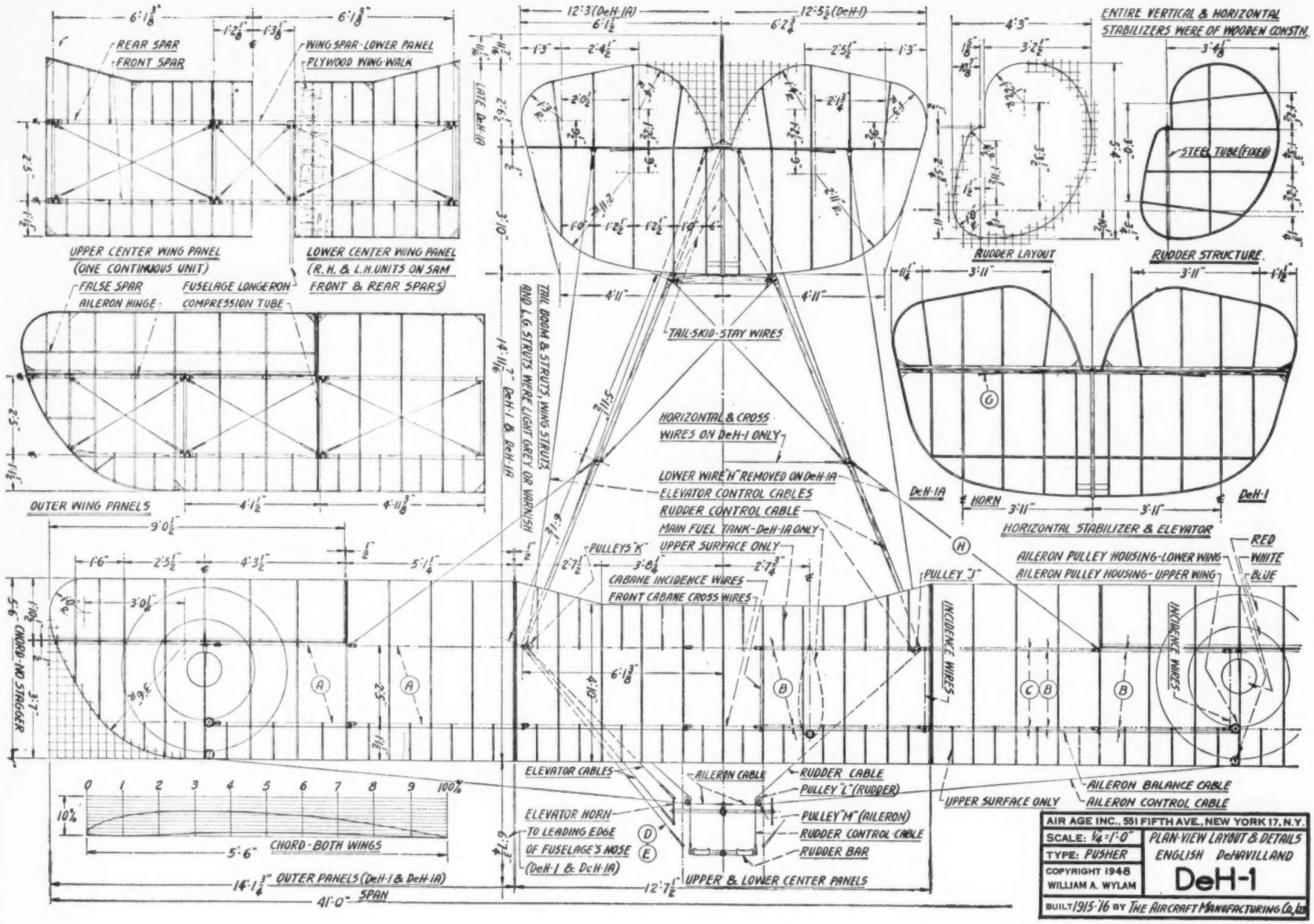
In combination with low pitching moment, low profile drags are desirable. However, the profile drag cannot always be reduced in one range of lift coefficients without increasing the profile drag in another range. A specific design determines this range.

High values of maximum lift-drag ratio are particularly desirable for helicopters in the hovering condition and at low forward speeds. The significance of this criterion in itself decreases as the forward speed of the craft increases, because the range of attack angles through which the blade section operates, increases. The importance of high critical Mach numbers increases as the forward speed of rotating-wing aircraft rises.

The importance of high maximum lift coefficients increases also, with the aircraft's forward speed. The airfoils tested had relatively high critical Mach numbers at fairly high lift coefficients. This means

(*Turn to page* 51)


NACA 1-H-15
HIGHEST LIFT-DRAG RATIO, HIGHEST PITCHING MOMENT (FREE-FLIGHT WITH TAIL)
NACA 2-H-15
2ND HIGHEST PITCHING MOMENT, 3RD IN LIFT-DRAG RATIO (FREE-FLIGHT WITH TAIL)
NACA 3-H-13.5
3RD LOWEST PITCHING MOMENT, 4TH IN LIFT-DRAG RATIO (FLYING WING)
NACA 4-H-12.4
2ND HIGHEST LIFT-DRAG RATIO, PITCHING MOMENT RATHER HIGH (FREE-FLIGHT WITH TAIL)
NACA 5-H-15
2ND LOWEST PITCHING MOMENT, NO OSCILLATIONS (FLYING WING)
NACA 6-H-15
ZERO PITCHING MOMENT (FLYING WING)
NACA 23015
STANDARD SERIES AIRFOIL USED AS COMPARISON
HIGH C_L MAX., LOWEST LIFT-DRAG RATIO


REAR SPAR
FRONT SPAR
WING SPAR · LOWER PANEL
PLYWOOD WING WALK
UPPER CENTER WING PANEL
(ONE CONTINUOUS UNIT)
LOWER CENTER WING PANEL
(R. H. & L. H. UNITS ON SAM
FRONT & REAR SPARS)
FALSE SPAR
AILERON HINGE
FUSELAGE LONGERON
COMPRESSION TUBE
OUTER WING PANELS
5'-6" CHORD - NO STAGGER
0 1 2 3 4 5 6 7 8 9 100%
10%
5'-6" CHORD - BOTH WINGS
14'-1 3/4" OUTER PANELS (DeH-1 & DeH-1A)
41'-0" SPAN
TAIL BOOM & STRUTS, WING STRUTS AND L.G. STRUTS WERE LIGHT GREY OR WARNISH
14'-11 1/16" DeH-1 & DeH-1A
TAIL-SKID-STAY WIRES
HORIZONTAL & CROSS WIRES ON DeH-1 ONLY
LOWER WIRE "H" REMOVED ON DeH-1A
ELEVATOR CONTROL CABLES
RUDDER CONTROL CABLE
MAIN FUEL TANK - DeH-1A ONLY
UPPER SURFACE ONLY
PULLEYS "K"
CABANE INCIDENCE WIRES
FRONT CABANE CROSS WIRES
ELEVATOR CABLES
AILERON CABLE
RUDDER CABLE
PULLEY "L" (RUDDER)
ELEVATOR HORN
TO LEADING EDGE
OF FUSELAGE'S NOSE
(DeH-1 & DeH-1A)
PULLEY "M" (AILERON)
RUDDER CONTROL CABLE
RUDDER BAR
12'-7 1/2" UPPER & LOWER CENTER PANELS
ENTIRE VERTICAL & HORIZONTAL STABILIZERS WERE OF WOODEN CONSTN.
STEEL TUBE (FIXED)
RUDDER LAYOUT
RUDDER STRUCTURE
DeH-1A
HORN
DeH-1
HORIZONTAL STABILIZER & ELEVATOR
PULLEY "J"
AILERON PULLEY HOUSING - LOWER WING
AILERON PULLEY HOUSING - UPPER WING
RED
WHITE
BLUE
INCIDENCE WIRES
INCIDENCE WIRES
UPPER SURFACE ONLY
AILERON BALANCE CABLE
AILERON CONTROL CABLE
AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
SCALE: 1/4"=1'-0"
PLAN-VIEW LAYOUT & DETAILS
TYPE: PUSHER
ENGLISH DeHAVILLAND
COPYRIGHT 1948 WILLIAM A. WYLAM
DeH-1
BUILT 1915-16 BY THE AIRCRAFT MANUFACTURING Co. Ltd.

Basic Radio Control

by E. J. LORENZ

A simple description of radio control for those with little R. C. knowledge

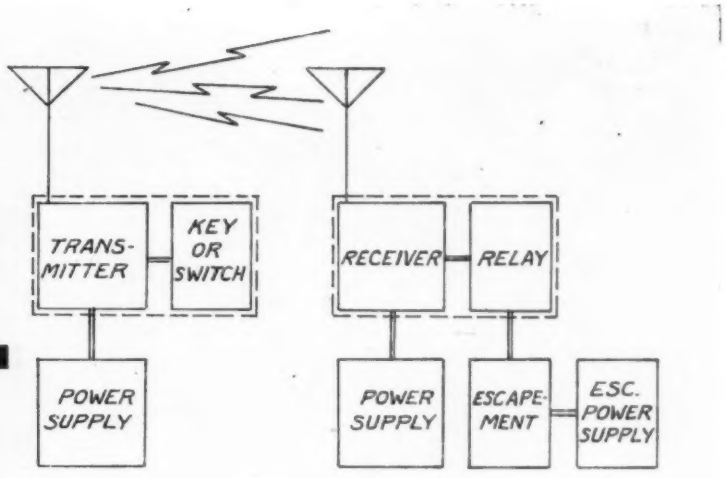


Fig. 1 Basic radio control setup

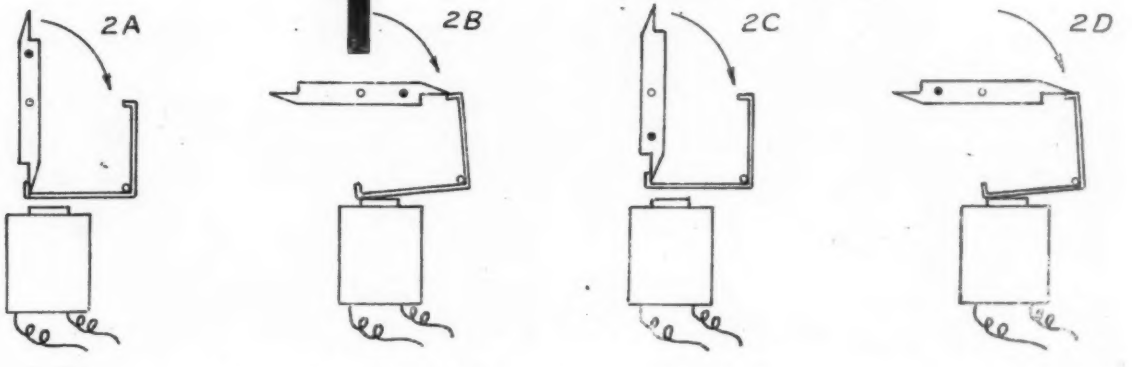


Fig. 2 Escapement sequence. Black dot on rotating arm represents pin that operates rudder arm

THE theory and practice of radio control is not new, dating back to pre-World War I days. The ultimate goal of every model builder is to be able to relax under a beach umbrella and, just by pushing a button, have his model respond to his every wish. This all sounds fine, and someday it will be just as simple as that. However, it is our aim here to point out, in non-technical terms, what can and cannot be done at present . . what kind of plane is needed . . and the answers to those other perplexing questions asked by the person just starting in radio control.

First of all, in any radio work we need a signal generator or transmitter. This is an electrical device for producing the high frequency electrical impulses that are sent out over the transmitting antenna. At present, the most widely used frequency is the 6 meter Amateur band of 50 to 54 megacycles. This means the transmitter is capable of producing a current that alternates 50 to 54 million times a second. The term "carrier frequency" refers to the basic frequency of the transmitted radio signal. The term "channel" as applied to radio control means that ordinarily, as in most commercial units on the market, only one carrier frequency is used. Hence, one transmitter and one receiver would be a single channel unit. For two or three channel operation, two or three transmitter-receiver units would have to be used. The term channel could also apply to one radio frequency carrier, upon which have been superimposed one or more audio frequencies. More will be said about this method later.

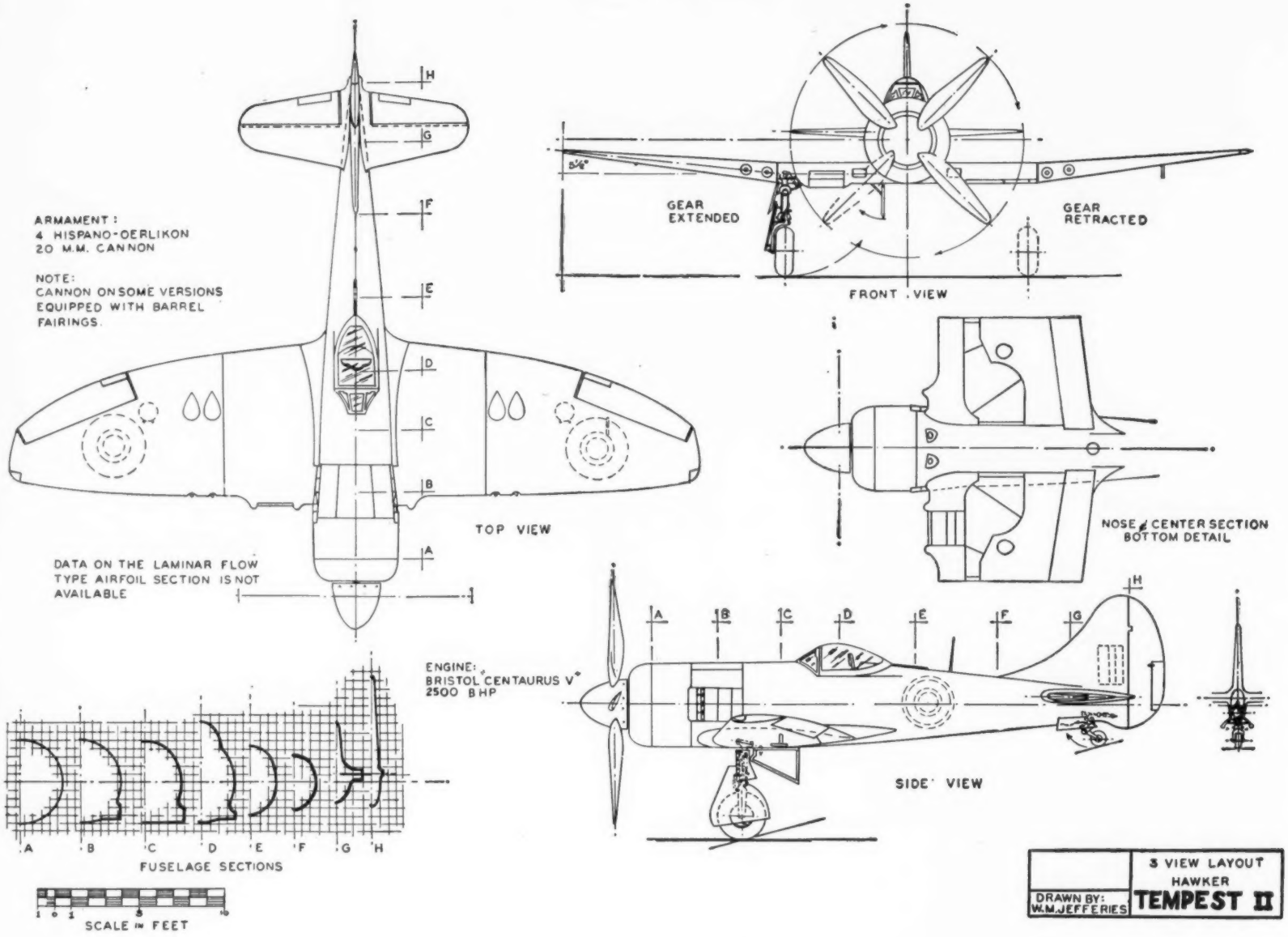
In order to pick up or detect this carrier frequency that is sent out over the transmitter antenna as the key or button is pressed, a receiver is needed. Whenever a receiver is tuned to a particular transmitting frequency, certain things happen in the receiver which change the amount of current flowing in the plate circuit of the receiver tube. Since this change is only a thousandth part of an ampere, a very sensitive relay is needed which will respond to this very small change in current. The relay acts as a switch between the receiver proper and the actuating device. In order to make a sensitive relay, many many turns of very fine wire are used to wind the coil. It is primarily the amount of work needed to wind this fine wire that increases the cost of this type relay.

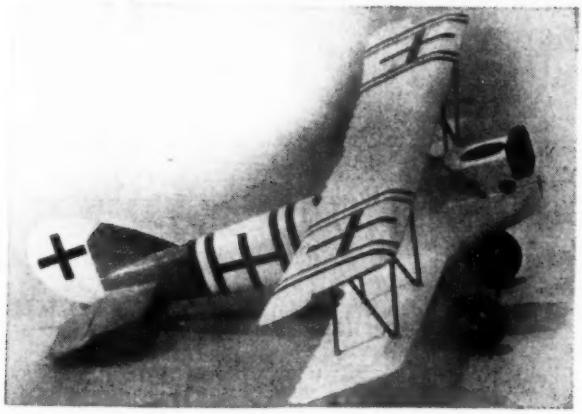
Our prime purpose so far has been to transmit a signal, pick it up with a receiver and then actuate a relay on the receiver in synchronization with the keying of the transmitter. (Fig. 1). After the relay points make contact, due to the radio signals being received, our control becomes a mechanical and electrical problem.

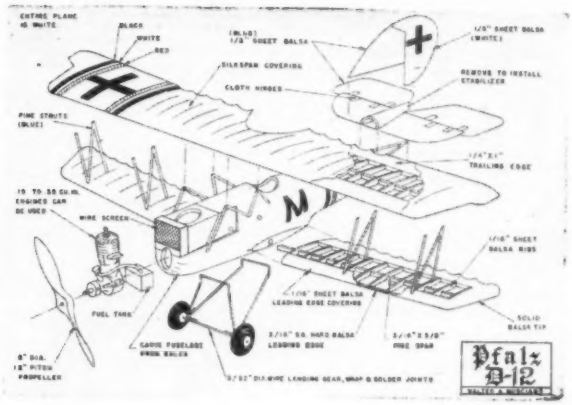
The majority of control systems in use today employ an escapement for moving the control, whether it be the rudder, elevator, engine control or other device. An escapement is perhaps the lightest and simplest device and requires the minimum amount of batteries. The action of such an escapement is shown in Fig. 2. This particular type is self-neutralizing; which means that as the operator's finger is removed from the keying switch, the control automatically returns to neutral. A four arm escapement is also used but requires an extra impulse to make the change from left or right, back to neutral. Fig. 2A shows the escapement in a neutral position, with no current flowing through the coil.

When a signal is sent out into space and picked up by the receiver, the points of the relay close, thereby completing the circuit between the escapement coil and its batteries. This pulls the armature down and allows the arm to move to position 2B. A rubberband supplies the torsion power to the arm. The pin on the arm thus moves from neutral to right. When the transmitter goes off the air, the signal is gone and the relay points open, thereby cutting the current off the escapement coil. The arm now swings around to neutral again as shown in 2C. The next time a signal is received, the

(*Turn to page* 36)


ARMAMENT :
4 HISPANO-OERLIKON
20 M.M. CANNON
NOTE:
CANNON ON SOME VERSIONS
EQUIPPED WITH BARREL
FAIRINGS.
H
G
F
E
D
C
B
A
TOP VIEW
DATA ON THE LAMINAR FLOW
TYPE AIRFOIL SECTION IS NOT
AVAILABLE
GEAR
EXTENDED
GEAR
RETRACTED
FRONT VIEW
NOSE & CENTER SECTION
BOTTOM DETAIL
ENGINE:
BRISTOL CENTAURUS V
2500 B.H.P.
A B C D E F G H
FUSELAGE SECTIONS
SCALE IN FEET
SIDE VIEW
3 VIEW LAYOUT
HAWKER
TEMPEST II
DRAWN BY:
W.M.JEFFERIES





Pfalz D-12

by WALTER MUSCIANO

IT was in early Autumn of 1918 that the Bavarian "Staffels" of the Imperial Air Service began using a new type single seat pursuit plane. At first glance the Pfalz D-12 resembled the famed Fokker D-7 because of the overhanging balanced ailerons and elevators, plus the nose located radiator. Actually it differed considerably in that the Pfalz was externally braced and had a plywood covered fuselage. Standard models were powered with the 160 hp six cylinder Mercedes engine which drove the ship at 121 mph. The ceiling was 19,000 feet and the craft landed at 48 mph. Armament consisted of two Spandau machine guns firing through the propeller arc.

The model Pfalz D-12 makes an excellent sport or stunt plane for engines from .19 to .35 cu. in. A wing area of 240 sq. in. gives it a light wing loading which is favorable in a model intended for stunting. A carefully applied, colorful paint job should make the model a stiff competitor at beauty events. The plans are drawn half size and, when completed, the model scale is 1 inch to the foot.

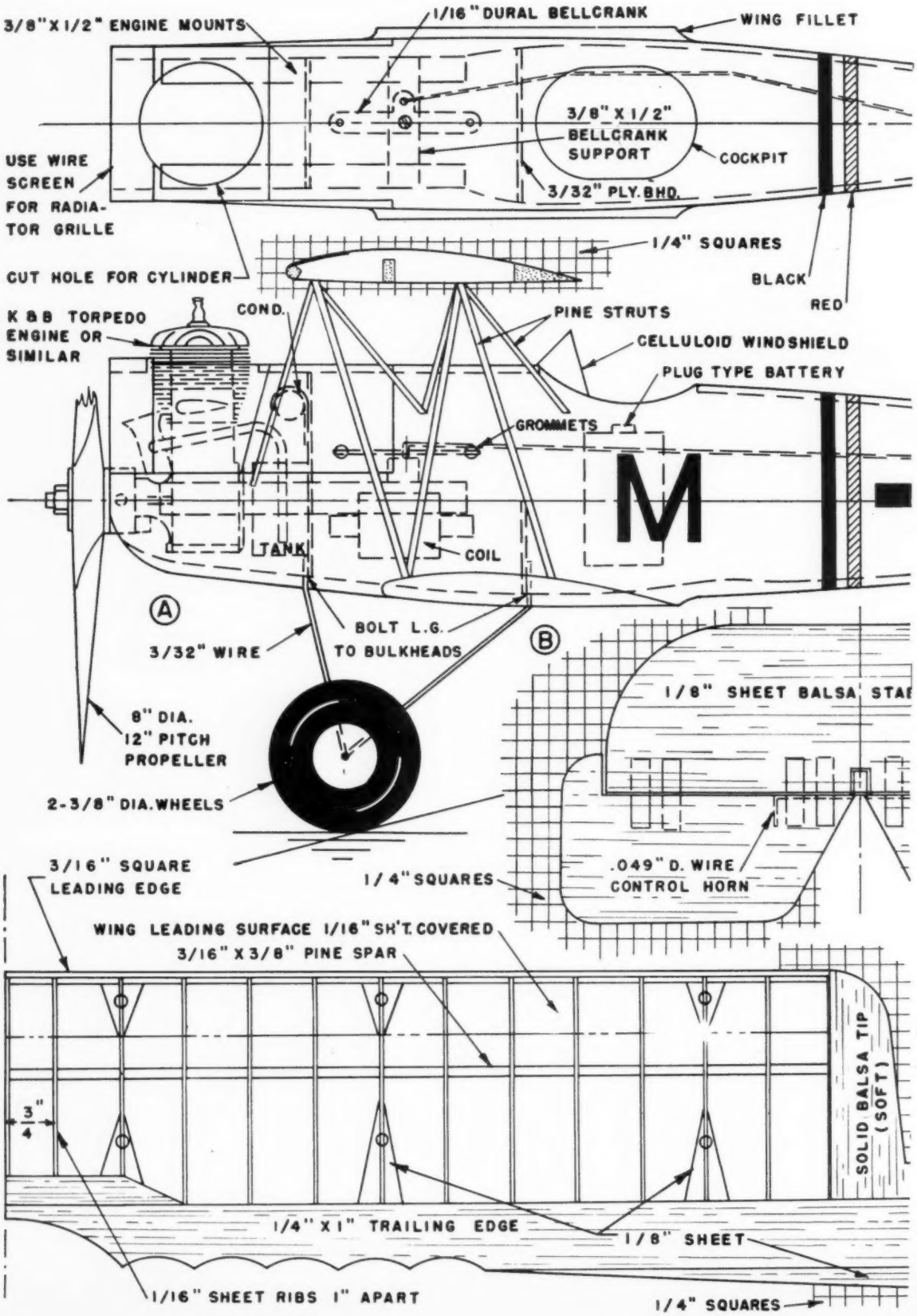
Medium soft, straight grained balsa is used for the fuselage. First cement together two balsa blocks, very lightly, along the horizontal centerline; trace the plan view and saw to shape. Repeat for the side view, then carve the fuselage to its proper shape; consult the sections on the plans and sand well. Pry the two halves apart and hollow to about 3/16" thickness. The hardwood engine mounts are cemented to the lower half as well as the two 3/32" plywood bulkheads. The 3/32" diameter landing gear struts are sewed or bolted to these bulkheads.

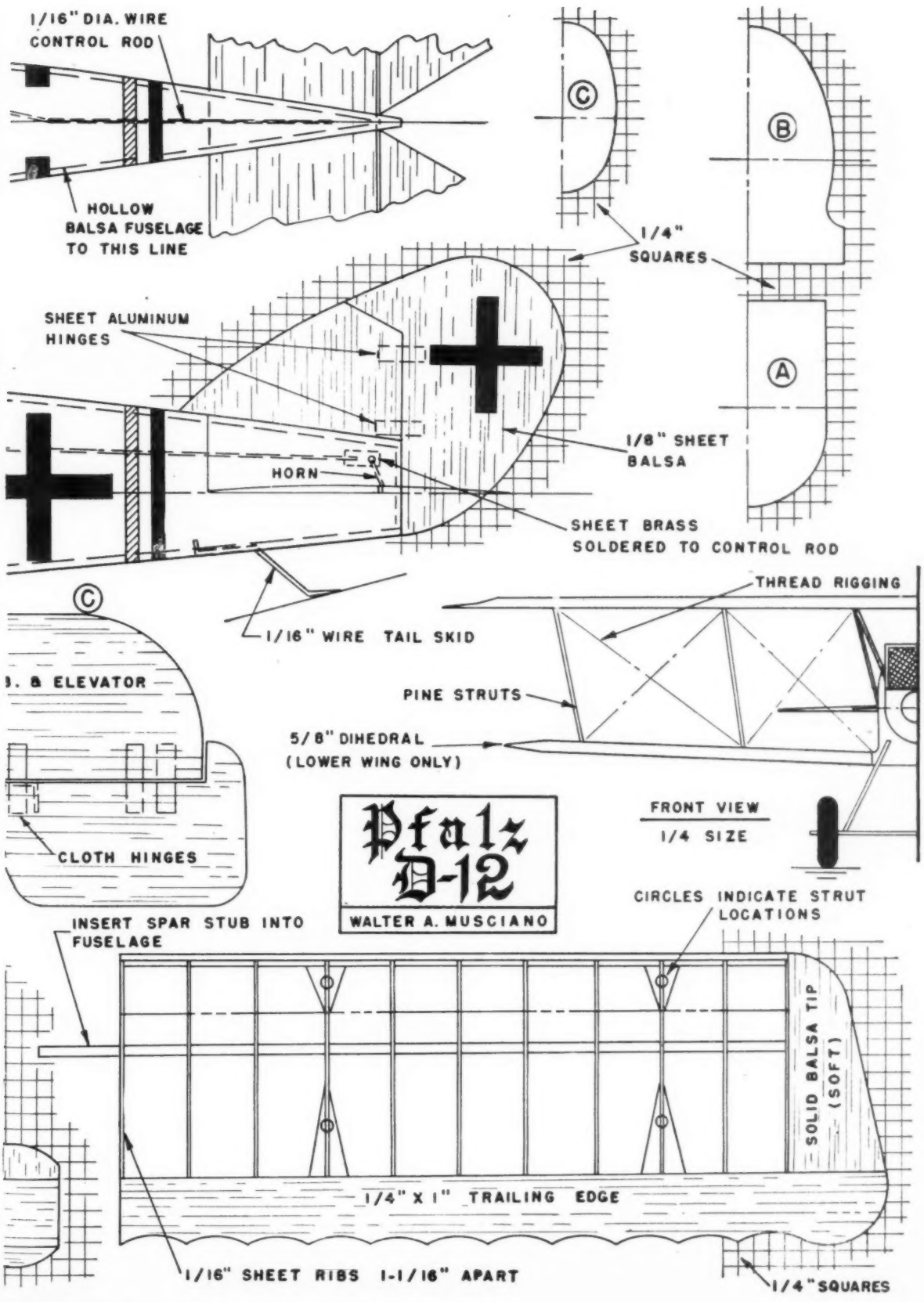
The ignition system is now installed in the lower half. All connections should be well soldered and the entire system tested. The switch, boosterplug and battery can be located in the cockpit for accessibility. The 3/8" x 1/2" hardwood bellcrank foundation is cemented to the mounts and the bellcrank bolted to it. When the control rod has been installed, the fuselage top and bottom can be cemented together. Cut away a portion of the fuselage to install the horizontal tail surfaces and cement the stabilizer to the fuselage. Fin, rudder and fairing block are assembled after the controls have been connected and are in working order.

Wing construction is quite conventional. The upper wing is made in one piece with no dihedral while the lower wing is in two panels. The 1/16" ribs are cemented to the spar followed by the leading and trailing edge. The leading surface is 1/16" sheet covered on both wings. Sand the framework before covering to be sure of a smooth job. Silkspan was used with 4 coats of clear and 2 of colored dope.

Cabane and interplane struts are cut from hardwood and cemented in their proper locations. The lower wing can be attached to the fuselage at the dihedral indicated with no incidence. It is recommended that the model be painted before the upper wing is attached. The model in the photos is colored all white with black crosses and red, white and black bands

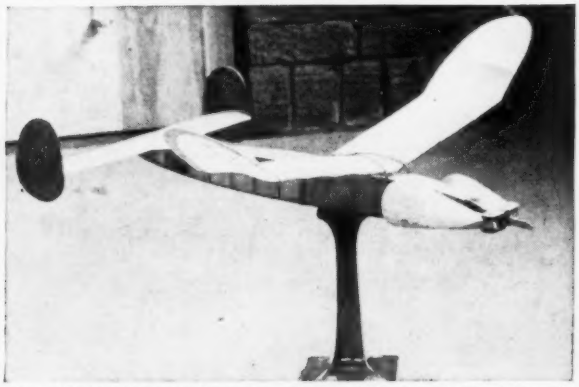
(*Turn to page* 50)


3/8" X 1/2" ENGINE MOUNTS
1/16" DURAL BELLCRANK
WING FILLET
3/8" X 1/2" BELLCRANK SUPPORT
COCKPIT
USE WIRE SCREEN FOR RADIATOR GRILLE
3/32" PLY. BHD.
1/4" SQUARES
CUT HOLE FOR CYLINDER
BLACK
RED
K & B TORPEDO ENGINE OR SIMILAR
COND.
PINE STRUTS
CELLULOID WINDSHIELD
PLUG TYPE BATTERY
GROMMETS
TANK
COIL
A
3/32" WIRE
BOLT L.G. TO BULKHEADS
B
1/8" SHEET BALSA STA
8" DIA. 12" PITCH PROPELLER
2-3/8" DIA. WHEELS
.049" D. WIRE CONTROL HORN
3/16" SQUARE LEADING EDGE
1/4" SQUARES
WING LEADING SURFACE 1/16" SH'T. COVERED
3/16" X 3/8" PINE SPAR
SOLID BALSA TIP (SOFT)
3/4"
1/4" X 1" TRAILING EDGE
1/8" SHEET
1/16" SHEET RIBS 1" APART
1/4" SQUARES


1/16" DIA. WIRE CONTROL ROD
HOLLOW BALSA FUSELAGE TO THIS LINE
C
B
A
1/4" SQUARES
SHEET ALUMINUM HINGES
1/8" SHEET BALSA
HORN
SHEET BRASS SOLDERED TO CONTROL ROD
1/16" WIRE TAIL SKID
THREAD RIGGING
PINE STRUTS
5/8" DIHEDRAL (LOWER WING ONLY)
. & ELEVATOR
CLOTH HINGES
FRONT VIEW
1/4 SIZE
Pfalz D-12
WALTER A. MUSCIANO
CIRCLES INDICATE STRUT LOCATIONS
INSERT SPAR STUB INTO FUSELAGE
SOLID BALSA TIP (SOFT)
1/4" X 1" TRAILING EDGE
1/16" SHEET RIBS 1-1/16" APART
1/4" SQUARES

No. 1 Norm Bell built this *Ohlsson* 23 powered original in Australia

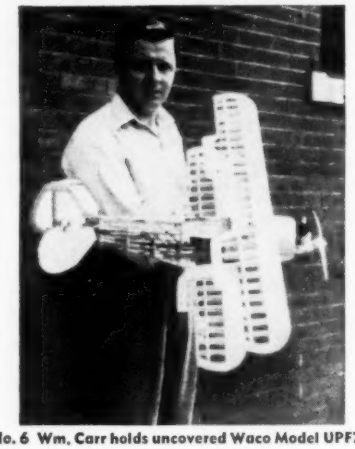
No. 2 ME-109 in which Frank Schwend has put real detail



No. 3 *High Performance Sportster* made from MAN plans by Frank Benwell

No. 4 New use for a jet! Flyingboat by Col. C. E. Bowden of England

No. 5 Prize winning Albatros D5, pride and joy of Don Yearout, powered by an Anderson *Spitfire*



No. 6 Wm. Carr holds uncovered Waco Model UPF7

Air Ways

EASTERN ASSOCIATION OF MODEL AIRPLANE CLUBS is the name of a new organization formed on Oct. 23 at a meeting in New York City of prominent model leaders and club representatives from many states in the Northeast. Frank Bushey and Ed Yulke were especially active in organizing the meeting, at which committees reported on Constitution, Contest Calendars, etc. It was decided to set Club dues at $5 per year.

As a start, all clubs east of the Mississippi will be welcomed into the Association; later, if it becomes advisable, regional groups may be split off to carry on the work in their own localities.

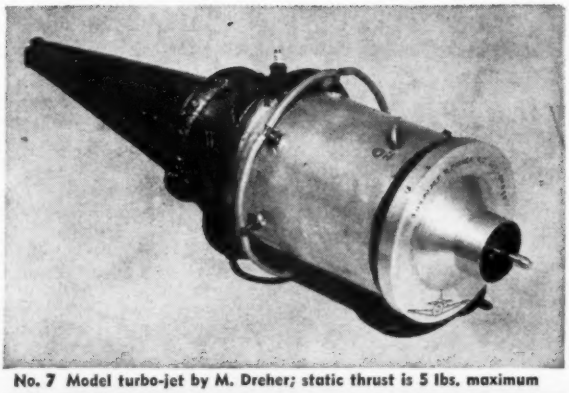
The primary aims of this new organization—like the very successful West Coast and Mid-West groups—are to coordinate contest dates and to aid the individual modeler and model clubs in every way possible, including liaison between flier and AMA. The Association will be organized as follows:

1. Club members (AMA license holders) will elect a Sectional Director (or Club Representative). 2. Sectional Directors will elect a District Director. 3. District Directors in a state will elect a State Director. 4. All State Directors will comprise the Board of Directors of the Association.

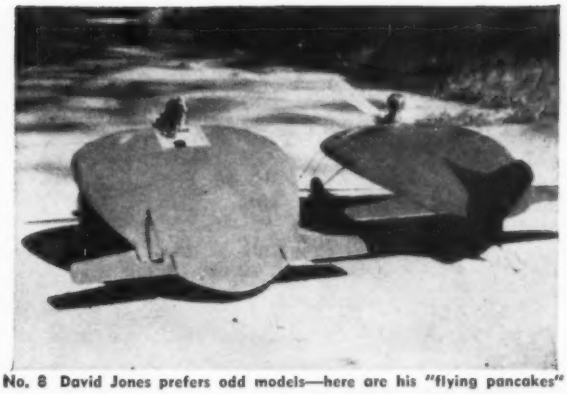
Future news about this new group will appear in this magazine and will also be disseminated through the "Eastern Flyer," a publication that will reach modelers and clubs in the East on the 15th of each month. For any additional information, write to Temporary President Frank Bushey, 210 Euclid St., Hartford, Conn.

WITH THE SEASON of indoor flying now prevalent in most parts of the country, we hear of an interesting indoor event which, oddly enough, originated in California, stronghold of year-around outdoor flying. John Acker, Pres. of *Inglewood (Calif.) Flightmasters,* writes that his group tried an indoor towline glider contest with very good results. The only restriction was on wing area (30 sq. in. or less), and most entrants used microfilm stick jobs. There were also cabin

News of Model Airplane Experimenters From All Over The World

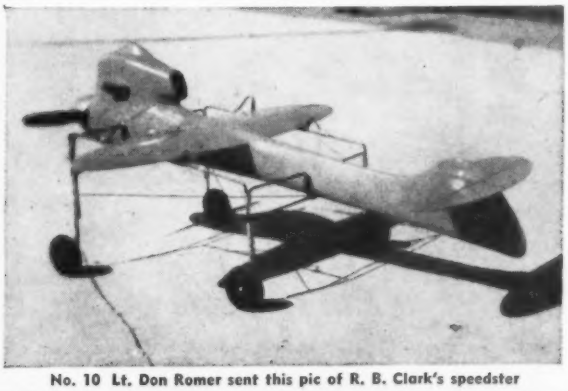


No. 7 Model turbo-jet by M. Dreher; static thrust is 5 lbs. maximum

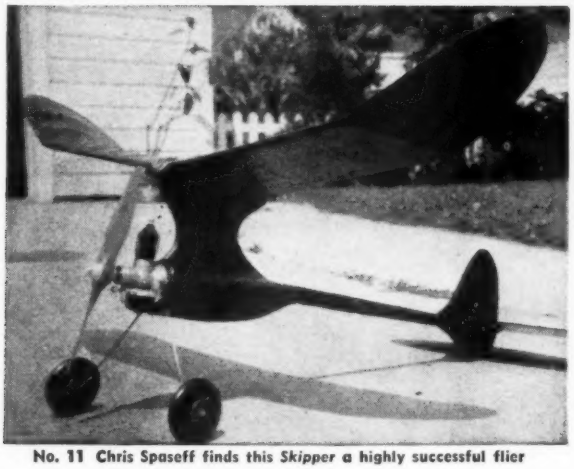


No. 8 David Jones prefers odd models—here are his "flying pancakes"

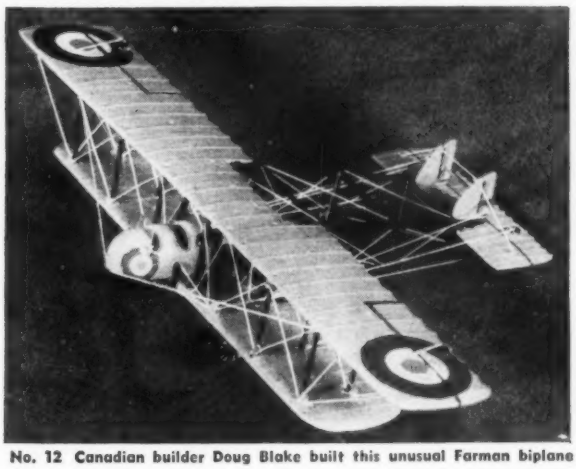
No. 9 Diesel powered Macchi M. C. 205 model by Cattaneo Gianni of Italy



No. 10 Lt. Don Romer sent this pic of R. B. Clark's speedster



No. 11 Chris Spaseff finds this *Skipper* a highly successful flier



No. 12 Canadian builder Doug Blake built this unusual Farman biplane

types, canards, etc. and interest was so high that the *Los Angeles Aeromodelers* will include the new event in one of its forthcoming inter-wing contests.

John tells us his club is trying all sorts of contest novelties to try and break away from the more commonplace events, and to give model activity a much needed shot in the arm. We hope other groups will also try out these novelty events.

IN LINE WITH THE general sentiment that U-control contest flying should be broadened so that more than just a handful of the really expert speed and stunt men will stand a chance in competition, Tex Foster of N. Y. City comes up with an idea for a "Precision Speed Contest." Rules would be very simple: the Contest Director would specify a certain speed for each engine class, the set speeds being far below the current speed record for the class. For example: Class A, 60 mph; B, 75 mph; C, 85 mph; D, 90 mph. The winner would be the flier who came nearest to the specified speed, *either above or below*. For such a contest, super hot motors or models would not be needed, nor would the modeler have to be able to spin like a top; plain run-of-the-mill models, including scale jobs, would stand a good chance. And, just as important, plain ordinary mortals could handle the moderate speeds required. Sounds like a good idea—who'll be the first to try it?

A CORRECTION has been found necessary on the plans for Jim Noonans' popular diesel motor, described in our May and June issues. On our published plans the dimension for the distance between centers of the connecting rod big and little ends was specified as 1-31/32", but the author states that the correct length is 1-31/64". The discrepancy was so large that most builders quickly noted it and compensated, but for those who have wondered how the engine could operate with the piston poking out the top of the cylinder, this is the answer.

* *

From far off Australia, Norman Bell (85 Wattle Valley Rd., Canterbury, Victoria) sends us Picture No. 1, showing the first non-pylon free flight model he has tried in some years. Despite lack of pylon, the model has a very good climb and the glide is quite satisfactory. Span is 54" and the model weighs 25 oz. Power is supplied by an *Ohlsson 23* turning a folding prop.

(*Turn to page* 57)

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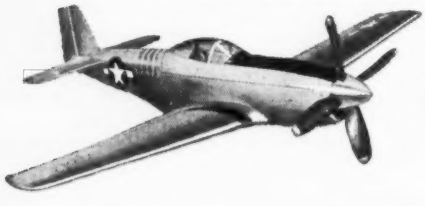

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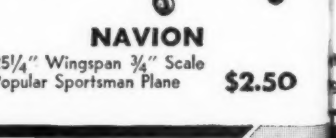

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spans to .49 Engines
ew tie requires no additional fitting or
's bea
balsa D PLASTIC COWL. Complete
nd numbers and striping.
leteicated Kit
$5

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will be parts.

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is sh. silkspan covering, wheels, and full-color
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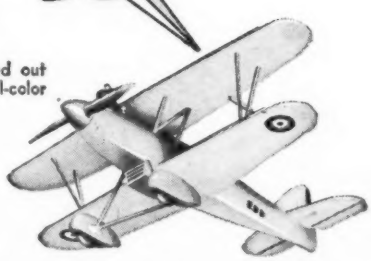

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START 'EM WITH *Rubber*

by William Vassalo

BUILDING AND FLYING RUBBER MODELS IS INVALUABLE TRAINING FOR LATER GAS MODEL WORK

Experienced builder explains simple rubber model to young enthusiasts

AN expression of awe covered the kid's face as he watched the gas job speed down the makeshift runway and lift into a graceful climb. Steadily it climbed to about 400', then automatically assumed a flat glide and started to descend in large, sweeping circles. The youngster, all excited, raced over to where it made a three point landing and I overheard him say, "Gosh, mister, I've built lots of models but they never seem to fly like that!"

I've heard practically the same thing uttered many times in my neighborhood and at various contests—by youngsters of about 12 who are fascinated by free flight gas jobs and U-Control; they seem to have no interest at all in rubber powered models, the proven best medium for beginners.

The popularity of rubber powered planes has followed a downward trend since the war's end even though good rubber is now easy to procure. Apparently this type of model no longer holds the interest of embryo modelers as it did 10 and 12 years ago. At that time gasoline powered planes were a novelty; but in recent years they have dominated the modeling world much to the dismay of some older builders who believe that rubber powered jobs are just the thing for the young builder "to cut his teeth on."

Rubber powered models provide the young modeller with a solid foundation that serves as an excellent stepping stone to gas jobs. The ease with which fine adjustments can be made on small stick and cabin jobs cannot be equaled by any other type.

When I was launched into this fascinating hobby some 12 years ago my first model was that of a Waco D Pursuit, then sold in the ten cent stores. I'll never forget the day the ship was completed. The day before I had worked on it until 11 p.m. and finally stowed away the paraphernalia after much persuasion by my mother. My subconscious mind was at work during the night and wakened me early the next morning. In my haste to test the ship I completely forgot about breakfast. Just like a kid, I expected great things from the (now that I look back upon it) monstrosity. Our backyard was an ideal place for test flying since it was covered with soft green grass. After gliding it several times, I dared to put 100 winds in the motor and launched it. What it did in the air will forever remain a mystery, but I recovered long enough to retrieve the pieces.

I was greatly disturbed with the result and my highly imaginative mind was momentarily subdued. With grim determination I decided right then and there to put it together again even though it did have those two biplane wings. After perspiring over it for another four days, the second version of the ship emerged. I scrutinized every part and found that an improvement had taken place insofar as looks were concerned; but getting it to fly properly, I thought, was going to be the stumbling block. Closely following the procedure I used with the first ship, I was at the stage where I again put 100 winds in the motor. This time, a bit skeptical about launching the job, I let it take off under its own power. The resultant flight —that lasted 10 seconds and traveled 5 yards—amazed me, and caused my next ship immediately to become vivid in my mind.

That started me off until I was spending more time than I should on the hobby. Mother scolded me with regularity for being careless about leaving balsa scraps scattered about the house. She also threatened that if I kept neglecting my schoolwork I'd grow up to be an illiterate. The nauseating odor (to the family) of dope and acetone nearly cut short my career, except that I was clever enough to do some much needed chores around the house.

Several years passed—I became quite familiar with wing areas, dihedral angles, airfoils, props, construction and adjustments. All these things were learned the hard way, but rather inexpensively. They consisted of numerous crackups, anger and discouragement. But when I reminisce about the past there were many happy moments and amusing incidents that will always linger in my mind.

Things have changed a great deal since then. I've seen many youngsters toiling away on a U-Control job as their *first* project. It seems foolhardy to undertake such a job when their knowledge of models is almost nil. Moreover, the expense involved is another factor that should be considered but hardly ever is. Actually, there are very few young modelers who, after building such a ship, attain the results they expect. They become overly enthusiastic upon watching some older and more experienced builders put their ships through their paces. Most of them do not

(*Continued on page* 40)

Richard Williams learned tricks of aeromodeling by flying rubber jobs like this Curtiss *Robin*

After learning elementary modeling with rubber types, young builders are prepared to tackle big gassies like this job being readied by members of the *Schenectady Aeroneers M. A. C.*

AUTOMATIC RUDDER OFF-SET

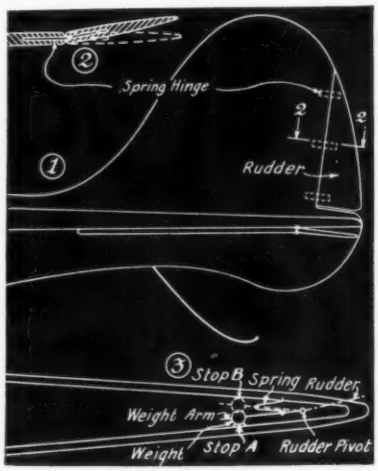
by RAY RUSHER

TO get a few more miles per hour from a plane having the rudder off-set for holding the controls taut, automatic means can be provided to eliminate the off-set upon the attainment of a predetermined speed. Thus off-set for takeoff and slow speed flying can be had, and at the same time 0 deg., or at least less off-set, can be had at the higher speeds.

The simplest arrangement is to use leaf spring hinges as illustrated in drawings 1 and 2, of such thickness and stiffness that the wind pressure created against the rudder as a result of the plane's forward travel at speeds over 25 or 35 mph will reduce the off-set to approximately 0 deg. as shown dotted in drawing 2. Off-set cannot be *entirely* eliminated with this method.

The width of the leaf spring, the original amount of off-set, and the area of the rudder will also have some effect on the speed at which off-set will be minimized. Suitable materials for the hinges are spring bronze, and spring brass or shim stock (brass) in thicknesses of .003" to .008".

To determine the characteristics of the springs you contemplate using, make up several dummy rudders of the sizes required and mount them by means of the different leaf springs on a bar rigidly secured to an automobile and extended laterally from one side. Have the rudders ar-



ranged at the desired initial off-set and in a horizontal rather than vertical plane so that deflection can be observed from inside the car. A cardboard scale marked in degrees can be attached to the rudder support for accurately determining the deflection at different speeds. Drive the automobile on a calm day at gradually increasing speeds; the degree of off-set can be tabulated and the proper hinge to suit your needs selected.

Another method that does permit reducing off-set to absolute zero is shown in drawing 3. Centrifugal force acts on the weight to aid wind pressure against the rudder in swinging the rudder in such a direction that the weight recedes from stop A and engages stop B placed to secure 0 deg. off-set. Centrifugal force is the final determining factor that insures positive engagement with stop B. You may even find that your plane performs better and flies faster if stop B is a few degrees past zero. The rudder then tends to off-set centrifugal force encountered at higher plane speeds. It is also advisable to install a stop comparable to stop B in the arrangement of drawings 1 and 2 to counteract side winds that tend to blow the plane in toward the pilot.

The second form of off-set eliminator can be tested on an automobile by calculating centrifugal force and applying pressure on the weight arm of a dummy test set-up which is equivalent to centrifugal force

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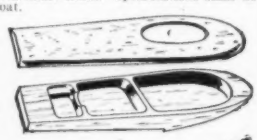

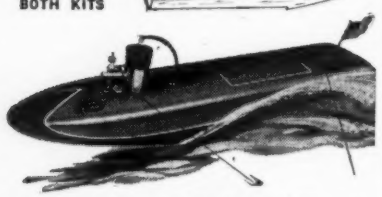

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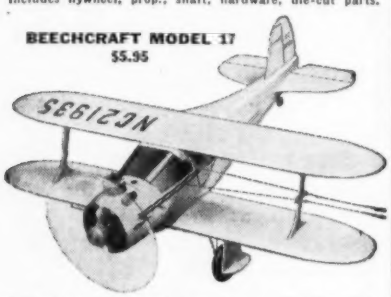
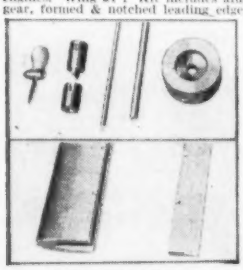


Prefabricated with finished fuselage carved both inside and out. For .099 to .49 glow plug, ignition or diesel engines. Wing 24". Kit includes aluminum cowl, formed gear, formed & notched leading edges, all hardware.



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at the car's speed of travel. This pressure can be applied by substituting a spring scale for the weight, preferably through a cord over a pulley to the inside of the car where the scale can be conveniently adjusted and read. It will be found that the weight in drawing 3 can be relatively small and yet accomplish its intended purpose. Length of the weight arm is also a determining factor.

The weight and the spring of drawing 2 are illustrated as being located inside the fuselage, and an adjusting screw for the tension of the spring may be devised to extend through the fuselage to a point of access outside. The pivot or hinge for the rudder should be free-working without any binding. (An excellent hinge that satisfies this requirement is described in the January 1946 issue of this magazine.)

IT'S TIME FOR A CHANGE

Says Don R. James

WHEN Carl Goldberg introduced the pylon job in 1939, it was the beginning of a new era in free flight gas models. Under the existing rules Mr. Goldberg did about the only thing he could to improve performance, and admittedly the results were spectacular; but isn't it a little foolish to have rules which promote lost models? In my opinion the Rules Committee has gone the wrong way and it is high time they do something about it. If you have noticed the many recent articles regarding this problem you'll see there are others who agree.

If you will steady my soapbox, I'll proceed to offer my solution to this great problem. Most of what I will say has been heard by all of us, but I believe it is worth repeating. Next time you're at a contest count the number of ships spiraling or otherwise returning to earth disasterously. This was the fate of almost half of the ships at the 1948 Plymouth contest. Look also at the models going out of sight never to be seen again; at the farmers tearing their hair and making threats; at the pile of junk that staggers into the all important thermal and floats away to first place; at the crosseyed timer watching a buzzard for a 96 minute record; etc. There is so much room for improvement that I sometimes wonder how the rules got that way. I say we are defeating our purpose when we build a ship to stay up a long time and then load it with gadgets to bring it down. If models were built thermal resistant in the first place there would be no need for that useless mechanism.

After all this nasty comment you are probably wondering what I do want. Well, here it is. This is not based on theory but is the result of experiment, i.e., the "First Western Sport Contest," sponsored by the *Los Angeles Thermal Thumbers*. Credit for starting the meet goes to Joe Meckoll, who said we would have this contest if he had to put it on by himself. The basic rules were a three flight total of 4½ minutes, with an engine run between 20 and 30 seconds. Closest total to 4½ minutes was declared the winner. Hand launching was decided on to promote all possible entries. 48 contestants were entered. They consisted of many U-controllers, most of whom are now converted free flight fans. At the time there were still many skeptics who did not enter, but after witnessing the contest many are now convinced.

Noteworthy among the many scale entries was a D.H.4 by Granger Williams, a small Howard "Pete" and an Aeronca "Champion." Hans Wall of the *Thermal Thumbers* flew a beautiful nine year old midwing design which weighed 37 oz. It was powered by a *K&B Torpedo* and had 300 sq. in. wing area. The majority of ships were of the type usually referred to by contest flyers as "Clunks."

A contest like this cannot be appreciated until one has participated. There were no protests, and to my knowledge only one crackup. The timers were not hung up for long periods of time and could have been half blind. More interest in the construction and finish of a model would be promoted if this contest became a regular event. It is well worthwhile to put a beautiful finish on such a ship, while it is a waste of time on the present type.

Granger Williams with his *Forster* 29 powered radio controlled Fokker D7. Don't criticize lack of interplane struts—the first experimental D7 didn't have 'em either!

The only disadvantage I can find in the sport model is that a hot engine, efficient propeller and special design are not required. This could be easily corrected by having a duration contest for the same type of model. With this setup the same ship may be flown in both contests. I find a wing loading of 12 oz. per 100 sq. in. area and a power loading of 140 oz. per cu. in. is about right. This would mean a .29 job with 350 sq. in. would weigh 42 oz. To get a ship like this over 2½ min. would require real skill on the part of the designer and would lessen the part played by luck.

I have spoken, Brothers—it's time for a change!

Basic Radio Control

(*Continued on page* 25)

same procedure follows and the arm and pin continue around to the left, 2D. When the key is again released the arm returns to 2A. If a yoke is placed over the pin and pivoted at the control hinge, a neutral to right to neutral to left and back to neutral movement will occur as the arm rotates. This matter of going through this sequence at all times should be of no concern since the movement is too rapid to have any noticeable effect on the flight path of a plane or on the path of a boat.

Two pencells in series will supply power to the escapement for several 15 to 20 minute flights. Small electric motors, suitably geared down to 6 to 10 rpm's may also be used. These of course will place a larger drain on the power supply, thereby necessitating more or larger cells. If one can tolerate the extra weight and size of the additional equipment needed to use an electric motor, a motor will make an ideal method of moving controls. With an electric motor actuating the control, the control may be stopped in any position and may be placed on either side of neutral, consecutively, without going through the sequence required with an escapement. Using an electric motor in

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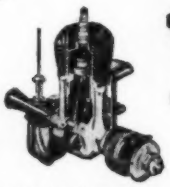

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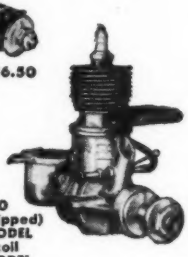

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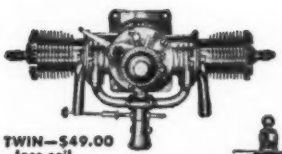

OK TWIN—$49.00
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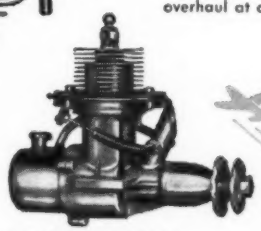

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Super 29	B	.299	.760	.660
Super 60*	D	.604	.900	.930
Twin	Exp.	1.208	.900	.930
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*Super 60 also available in Raceway-Marine model equipped with flywheel

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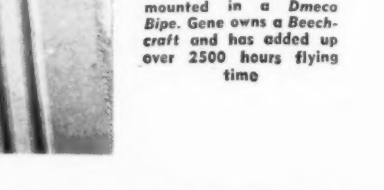
Famed cowboy star Gene Autry has a great interest in all phases of aviation. Below we see him catching up on the latest angles of model plane work. At left he examines a new experimental *Micro Diesel* mounted in a *Dmeco Bipe*. Gene owns a Beechcraft and has added up over 2500 hours flying time

such a hook-up usually requires two receivers, one to close the circuit so that the motor runs in one direction and the other to reverse the current to run the motor in the opposite direction.

One phase of radio control that has not been fully developed as yet is audio control and pulse modulation. As you have learned in physics classes, audio frequencies are those that fall within the range which can be heard by the human ear, roughly between 16 and 15,000 cycles per second. By super-imposing one or more audio frequencies on a single radio frequency carrier, at the transmitter, we have the equivalent of several channels. The main difficulty with such a system is with the receiver, because of the filters needed to separate each audio frequency through its own relay. Until recently such an audio system weighed approximately



4 to 8 ounces per channel, not counting the weight of the receiver-detector circuit. In addition to this, larger batteries also added to the total weight. In recent months, however, smaller components have become available, with which a single audio channel receiver may be built to weigh as little as 1¾ ounces. Much experimentation still will have to be done along this line, but audio control may definitely be the coming thing.

Pulse modulation is a system whereby the regular radio frequency carrier is interrupted at a low frequency rate. Since this is not a technical article, we will not go into detail on this system, but it has the advantage of providing what is known as proportional control. Instead of a button or key, a small control stick similar to that used in a large plane is employed. The controls in the plane follow the same movement as the stick on the control box. Needless to say, this is as near the perfect answer to complete radio control as can be imagined. Perhaps the most famous designer and exponent of this system is Jim Walker, who won the R. C. event at the '46 Nationals using proportional control. Second place winner George Trammell at the '48 Nats used a simplified form of proportional control. (See M.A.N. June 1947 for description of equipment used by Trammell.)

Don't get excited over such a system, however, and start visualizing a multi-engined job having everything but hot and cold running water. A unit like this is not so simple and it is heavier and bulkier than most commercial units on the market today.

For those who intend to buy their own equipment, we'll give just a summary of what is available. Many components used

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in commercial units are not readily available to the individual who wishes to build his own unit. All the sets that will be described here have been advertised in the leading model magazines. The first unit to appear on the market was put out by Radio Control Headquarters and did much to promote radio control among model builders. Both escapement and electric motor controls are available with this unit. Next appearing was the Good Brothers unit, produced by Beacon Electronics. This unit is similar to the one that has won them many contests and skyrocketed them and radio control about to the point where it is today. The Bell Sound System next put out a unit which was a little ahead of its time as far as design is concerned. Although it is larger in size and heavier than most other models, it is the ideal unit for a boat. The latest to appear on the market is the *Aero-Trol* set, produced by Aero-Spark. This particular unit has appealed to modelers because of its very small size and extremely low weight. (Receiver weighs less than 2 ounces.)

All of the units mentioned, with the exception of the Bell unit, are of the single channel type using an escapement to actuate the control. The Bell unit uses an audio-pulsed circuit and has an electric motor to move the control. This in effect is similar to two channels.

It is believed that the present amateur frequencies will be the only ones available for radio control work for at least another year, perhaps longer. The much talked about license-free bands and the Citizens' Radio Service band present design and construction problems that must be overcome, due to the nature of the high frequency of 462-648 megacycles. When these new units eventually reach the market radio control will be wide open and someday will enjoy the popularity now held by U-control models. Until then, the radio control fan would benefit himself and this rapidly gaining phase of model building if he would concentrate on developing various types of control actuating devices. An outstanding example of this is the development of the Rudevator (see M.A.N. July '48, p. 32). Keep your control device simple, lightweight and economical on battery drain.

The first radio control contest of 1948, and so far as is known the first of its kind anywhere in the country, was held at Valley Stream, New York on May 2. The contest was liimted to radio controlled planes and a payload event. The R. C. event had 8 entries and was won by Joe Raspante, who used a set of his own design employing an RK-61 tube in the receiver.

After the wind subsided, towards evening, Fran McElwee flew his Drone-powered model with an Aero-Trol control unit. This 5 ft. model showed excellent control and executed various turns, spirals and spins using rudder control only. Magee's Model Shop of Mamaroneck, N.Y., had a two channel unit installed in a *Buccaneer* with rudder and engine control which had excellent response on the ground. The ship was not flown since it had not been test flown previously and no chances were taken with the stiff breeze. All in all, this one contest showed a bright future for radio control and emphasized the fact that rudder control alone is sufficient for excellent flights.

The 1948 Nationals had the best R. C. turnout since the event was inaugurated. Jim Walker proved his years of experience with R. C. by winning first place. As mentioned before, G. Trammell took

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2nd place. The latter used a proportional type control, while Walker used what he calls a *Pozzipo* unit. The other contestants used stepping relays, multi-channel units, and the old reliable escapement type of control. This one contest alone did more to stimulate R. C. than all the rest of the National contests combined. As this is going to press, there are rumors of a license free band radio control unit being developed that may hit the market by this spring. Miracles should not be expected from these free bands, but at least it will give the modeler something to work with, and allow more modelers to take advantage of this interesting phase of modeling.

The author hopes to be able to cover all commercial radio units on the market now, including several English jobs, in an article to be printed in M.A.N. soon.

In closing this brief summary of the essentials of radio control, the modeler should first determine the type and size model he wishes to build. Next, check all available units on the market, and the prospects of building his own set, to see that the radio set fits the plane, just as the proper size engine is needed. After building the plane and installing the radio, plenty of flying experience is needed to get maximum performance. A few extra hours spent in practicing turns and spirals will pay off at the next contest.

NOTE—Readers interested in radio control may obtain a list of articles on the subject which have appeared in past issues of this magazine by sending their request to our editorial offices.

Start 'Em With Rubber

(*Continued from page* 34)

seem to comprehend the simple fact that building models, like everything else, (and whether they be original designs or otherwise) is a skill derived from much constant practice, flying all types of planes in competition. Also, because of the many crackups these builders experience, a great many of them become disillusioned which in turn makes for a declining sport.

To illustrate this more pointedly, let me tell you what happened to an up-and-coming club of which I had been a member. The club started with 25 members and interest ran high. Fifteen of them were in their early teens and had never built models before. Although it is not necessary to go into detail, the basis of disinterest that developed seemed to stem from trying to accomplish, over a short period of time, what it generally takes others years to achieve. Quite a few fellows started on gas designs which they knew nothing about. Most of them were under the impression that all one had to do was put a ship together, take it out to the field and it would fly of its own accord. Well, when this sort of thing occurred repeatedly, our club was classified as being on the down path, with the inevitable result that it was disbanded.

I talked to other modelers with whom I had come in contact, and many of them related a similar story. It seems to me that the younger set can be started off on the right foot if those in charge of clubs will encourage them to build along the lines of elementary gliders and simple R.O.G. stick jobs first, then gradually work their way up to more complicated rubber designs, and ultimately to gas jobs. In this way I'm sure these builders will become experts and reap the benefits and full enjoyment that is singularly offered by this most fascinating sport.

Kilroy Is Here!

(*Continued from page* 11)

WING—As previously stated great emphasis was placed on the production of an efficient, durable and light wing. First prepare the ribs and tip pieces by fashioning them from medium-hard sheet balsa. Then lay out the leading and trailing edges, inserting the tip pieces and finally the ribs. When thoroughly dry remove it from the plan and insert the proper amount of dihedral. The sheet balsa gussets, spar and spar gussets are also positioned at this time.

Planking the leading edge section is done with medium-hard sheet balsa in four sections to allow for dihedral breaks.

EMPENNAGE ASSEMBLY — Incorporation of the rudder-vator type of empennage was mainly due to the desire to experiment with it on a competitive model. The results obtained warranted its use in the present model.

A slight variation to the more common method of turn adjustment was made by mounting a trim tab. This allows more positive rudder control with less surface involved, due to the unobstructed flow of the slipstream at this point in all flight attitudes.

The combined stabilizer and upper rudder component of this unit is assembled in a manner similar to that of the wing. A sheet balsa piece with a section removed, and remounted with metal hinges to act as the adjustment tab, forms the sub-rudder. A soft wire skid prevents wearing away the lower portion of this fin. The latter is sanded to a symmetrical airfoil section but is not mounted just yet.

COVERING—After a final checkup of the completed structure to locate any constructional defect which may materially weaken the model or prevent application of a smooth covering job, this operation may be tackled.

Kilroy was covered and doped a solid yellow. Lightweight yellow *Silkspan* should be applied wet to the wing and empennage surfaces with the aid of a heavy dope adhesive. Three or four thinned coats of clear nitrate dope with light sanding sessions between applications finish this phase.

Using a cut and fit method, prepare a template from bond paper for the cabin covering. After cutting out the window, glue on a sheet of fairly heavy celluloid trimmed to the template shape.

Silkspan GM is the covering material for the fuselage itself and is applied wet in four sections, with a dope adhesive. Attach the sub-rudder at this time with a generous coating of cement. The towline hooks are shaped and installed as well as the wire landing skid. Refer to the drawings for exact placement.

Two coats of clear and three of thinned yellow dope will prove sufficient for the fuselage. Follow the usual light sanding procedure between coats for this also.

ASSEMBLY—This is not a difficult operation due to the fact that only two components are needed to complete the model. Simply attach wing and empennage to the fuselage with the aid of rubberbands.

FLYING—Here's that decisive moment where the builder must exercise a little caution and judgment lest he invite disaster. Test flying a towline glider is no job to be hastily tackled. Your *Kilroy* is a well engineered design capable of contest-winning flights, but these can only be attained through careful adjusting and handling.

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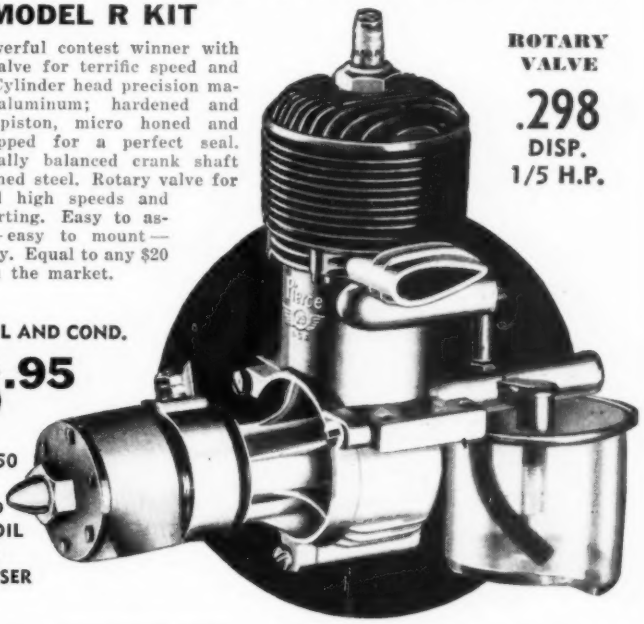

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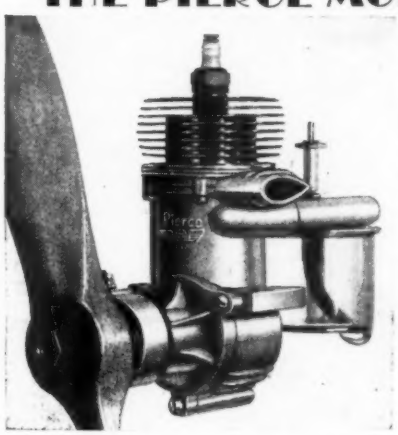

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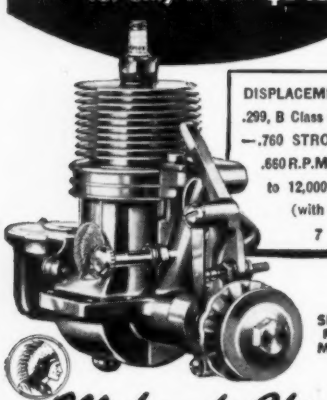

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After trial balancing at slightly more than half the wing chord from front to rear, check the model for any warping of surfaces and try a few short hand glides. Correct stalling or diving tendencies by altering nose ballast, or wing and empennage incidence, or both. If any violent maneuvering is noticed, check the wing and empennage surfaces, for undoubtedly a warp is present. After correction, again try more hand glides until a smooth fluid flight path has been attained.

With approximately 30 ft. of towline attached to the front towhook gently tow the model aloft into the wind, carefully observing the towing characteristics. If the model assumes a dangerous flight attitude release the towline from the hand. Again warping of the surfaces is without doubt the cause, so check and correct it.

Following the completion of several successful test flights a longer length of towline may be used, in addition to the more rearward placement of the towline on the model to obtain an increased angle of climb during the tow.

A gentle, shallow but tight right circle proved to be the most effective and can be produced by a slight amount of right rudder.

Of course you should have your name and address attached to *Kilroy* to prevent possible loss of the model. Here we will take leave and wish you happy thermal hunting. Rest assured *Kilroy* will do his part.

Scrap Box

(*Continued from page 8*)

Don Spiker (Joplin, Mo.) has been compiling figures on approximate costs; and Keith Storey is working toward the ultimate in dimensions and size of screen. As envisioned so far, this fence would enclose the circle to a height of 15 to 20 feet. By sighting on two or three sets of vertical lines on the fence, with the distance between the lines appearing tangent to the circle, it can be guaranteed that the model is flying at the prescribed distance from the center of the circle. Whipping would be overcome by specifying that the arms be held against the body, and that the flier must not move out of a circle approximately 30 inches in diameter. It would be impossible to whip because any shortening of the lines would cause the plane to fly inside the sighting lines, the violation being immediately apparent to the judges. Flying too high also would place the ship inside the sighting line.

Many localities that have not been hitting really high speeds—yet—may not see the need for such a fence. One nationally known figure in control flying makes this illuminating comment: "Most of the accidents I have observed were caused by the flier running too far from the pylon and flying into the contestants who were seated around the flying circle. I have seen the plane lost by the flier losing his grip on the handle, and even have seen injuries caused by parts of the plane flying into the crowd after it had crashed into the ground. Even with the pull test one expert had his plane fly apart in the air, fortunately causing only a foot injury. This man will fly speed no more. At most contests it is impossible to keep the crowd behind the screens; none of the contestants would think of being any place but a few feet outside the circle."

A number of other prominent leaders oppose the fence. "The current style of U-control has run into a blind alley," one of them told us recently. "Something must be done to make the game safer. The solution calls for radical changes and the last serious proposal has been to fence in the speed circle. While I must admit that the game has reached the point where it must be caged in, I know that such a development means extinction of the sport in the amateur sense, for the simple reason that the cost would make it prohibitive. We have enough trouble getting space to fly in, not to mention any such exclusive ground equipped with a $2,000 fence!"

This man is one of those that thinks the way is left open for the semi-scale model. If this sport is kept in hand from the start, he claims it would be safer to watch than contemporary stunt models. As active U-controllers know, the FAST club rules for semi-scale are getting favorable attention. These rules specify among other things that semi-scale racers have fixed landing gears and fully enclosed engines of not more than .29 engine displacement. It seems obvious that such ships would revive a lot of interest in modeling and provide a shot in the arm for the industry.

Let's face facts. Ultra high speeds are dangerous. Something must be done. Speed flying should not, cannot be eliminated. If the speed flier insists on going all out with no changes in his models, then the issue is simple. Either we fence them in—and numerous wildcat affairs certainly will take place rather than build fences—or we run the risk already apparent, of permanent harm, even legislation against powered flying. If speed fliers are amenable to changes in the models themselves, the problem is not quite so difficult to solve. Anything that steps up drag will slow down speed. Are we having more fun flying at 150 mph plus than we did at, say 125 mph? The choice here seems to lie between modifications to speed models and the relatively radical change of specifying semi-scale which, after all, does nothing but add more drag. Or perhaps, and this is highly debatable, we should consider limiting the larger motors.

From where we sit it would seem logical for the speed boys to take the bull by the horns, working out rules modifications that would result in lower speeds without taking away the thrill and satisfaction of speed competition. Semi-scale should also be encouraged, and it is our personal hope for the good of the sport that such ships eventually prove so much more popular than current speedsters, that the all-out speed model will gradually give way to something more attractive, and more safe for everybody. As we know from experience, pushing radical substitutions down anyone's throat always leads to cries of "Murder!"

As things shape up, 1949 promises many radical developments. The trend to semi-scale and realism also has hit free flight. A recent *Thermal Thumbers* meet on the Coast brought out bipes and other ships that had been in mothballs for as long as ten years! Why? The meet was a sport type affair with a three-flight total of 4½ minutes as the goal.

Jim Walker has offered $500 in prizes for a realistic gas event at the next Nationals. This event would call for the type of ship that once made free flight so popular: that of the semi-scale, heavily loaded, stable ship that can perform within a reasonable area. "I still maintain that it is just as much fun as U-control, and can be almost as exciting as radio control," declares Walker.

Before making his flight, the contestant files a flight plan in which he specifies length of time he will stay in the air, number of circles he will make, and states on which spot he intends to land. Points would be awarded approximately as follows: 10 for every second on the ground after plane is released for an R.O.G. takeoff; 10 for each circle if all in one direction, but 15 points for each circle if made

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Packet #12PP - Fighters:-Bell Kingcobra P-63 37[illegible] ABmC; Messerschmitt 109 32 ABmC; P-38 Lightning 52 BC; Hawker Tempest 34[illegible] ABmC; Douglas Dauntless SBD 40 ABmC.

Packet #13PP - World War I - all AB: Nieuport 17C.1 26[illegible]; Spad 13C.1 28; Fokker DS 26[illegible]; Fokker DT 22[illegible]; Sopwith Camel 27[illegible].

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Packet #3PP - Fighters: Northrup Black Widow P-61 16[illegible]; Hawker Hurricane 10; Hawker Tempest 10; Bell Kingcobra P-63 9[illegible]; Douglas Dauntless SBD5 10[illegible]; Bell Aircomet P-59A 12[illegible]; Messerschmitt 109G16 8[illegible].

Packet #4PP - World War I Fighters: Fokker DT 7[illegible]; Sopwith Camel T; Fokker DR 7; Nieuport 17C.1 6[illegible]; Spad 13C.1 6[illegible]; Albatross DVa 7[illegible]; SE5a 6[illegible].

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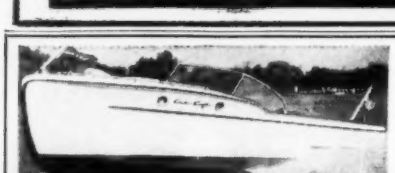

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in the reverse direction after at least two 360° turns. For every circle more or less than calculated by the contestant, he will be penalized 5 points. Then for every second of duration after takeoff, he will receive 2 points minus one point for every second over or under planned time. For a spot landing he will receive 100 points, less one point for every five feet from the chosen spot.

The change of direction in flight could be accomplished by a flight timer or some other device. The event would be somewhat similar to the payload event since the engine would have to be idled down so that the model will barely take off.

"I have felt for a long time," says Walker, "that a great mass of adult modelers will not chase contest-type free flight models or care particularly about U-control because they are afraid they will get dizzy, or that they will be shown up by the younger element whose reflexes are much quicker." As far as the writer is concerned, Jim has a kernel of truth here. Faced with the above choice, we took up Wakefield—but the darn things fly farther than freeflight gassies! Now we are fiddling with a sport type parasol, cockpit, headrest, and so on, with a span of 5 ft. for an *Ohlsson 23*. The prop is 2 inches too large, for even a *23* flies a big airplane too well when realism is required. A contest fiend acquaintance remarked, "Your engine will drop dead." Who cares?

Jim's suggested rules are only tentative, of course. With any new idea there are lots of bugs and attendant headaches. Usually the approach, being idealistic, tends to become complicated. Walker himself relates that Dan Calkin, whose enthusiasm seemed to know no bounds, thought that the proposed rules might be simplified by merely tabulating the number of circles and specifying that each plane must land within a given area—or no score. Now there is something to kick around.

As if all this isn't enough, big things are brewing in radio control. At the last Nationals the boys were so successful with their ships that speed races around pylons were talked about for future competition. Careful, look what speed did to U-control! Walker, who took first in RC at Olathe (no, this column isn't about Walker, though he keeps coming through the windows), has offered $500 prize money for such an event. Ships would be flown around a closed course with two pylons. The race would be run off in heats and would be patterned after the Goodyear Trophy Race at the National Air Races.

Not to change the subject, but rubber modelers will be interested in this rumor from England. A prominent British builder and authority tells us that an inside rumor has it that the Wakefield team who carried the colorful trophy back across the Atlantic were supplied with a special batch of rubber brewed by Dunlop for the occasion. Our "spy" is of the opinion that regular U.S. brown rubber is better than the regular British black rubber. Inasmuch as the great Copland flew with our brown rubber to share the headaches of the American boys, this rumor adds to the mystery. We still mean to have some of that magic black stuff!

From Urbana, Ohio comes this tall-but-true story of the month. "This afternoon I was flying my glow-plug *Ohlsson 23* powered *Trainee* on the local baseball field with the rest of the gang. I have a habit of bouncing my ship on the smooth ground and taking off again. On one bounce, a little too heavy, one of the sponge rubber tires was knocked off its hub and rolled along the ground a short distance away. A few minutes later I miscalculated again, making a much harder bounce than the first one, breaking the prop and ending the flight. When I walked over to see the plane, there was the lost wheel—back on the wire axle! The landing gear had hit the ground hard enough, on the center of the lost sponge rubber wheel, to push the tire over the hub and onto the wire landing gear."

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Design Forum

(*Continued from page* 13)

The problem, therefore, resolves itself into the *relative speeds* of these two rolling effects, the object for stability being a quick lateral recovery or roll about the longitudinal axis and a slow directional roll about the vertical axis. What characteristics give these conditions? Obviously, a large dihedral will contribute the quick lateral recovery as will also a low CG. The early historic K.G. gas model and the modern Pylon models are designed around this principle. On the other hand, the closer the center of side resistance (arrow S) is to CG the slower the directional roll will be and the less dropping of the nose will take place.

Now we come to the significant point. The fin controls the position of the center of side area and, therefore, the position of the resultant side pressure indicated by arrow S, Fig. 1. If the fin is large, this side pressure point will be considerably back of CG, Fig. 2A. This will contribute to a sharp directional roll and dropping of the nose. On the other hand, if the fin is made very small, this side pressure point will be close to CG and the nose will drop very little if at all before lateral recovery takes place.

This case is similar to many other problems where curing one thing often causes other difficulties. Sometimes if we make the fin with a particular area sufficient to create the desired degree of circling it may be too large in respect to spiral stability, because this amount of area will bring the point of side pressure far to the rear of the CG. Of course, the fin can be made smaller but then it may be too small to give proper directional stability. This can be the case where large wingspans are used because the fin size must be proportional to the wingspan. This difficulty may be overcome, however, by placing vertical area at the CG forward of the side pressure point, Fig. 2B. By doing this, the side pressure point is brought forward and closer to CG.

A typical example of this technique is the modern pylon model where the high pylon connecting the wing to the fuselage provides extensive side area well forward of the center of side pressure S. In this way, the center of side pressure can be kept forward even though a large fin is used. So if you find that a very small fin must be used on your model in order to allow the side pressure point to be sufficiently far forward, add more side area in front of this point; then the fin can be made larger. The larger fin will give proper directional stability, and a combination of forward side area with this fin will bring the side pressure point sufficiently toward the nose to reduce the dropping of the nose when the model circles and banks.

These are conditions present in all models but they apply especially to slow speed ones such as old style rubber powered and low-powered gas models. The typical example where these principles are most effective is the indoor model which flies at approximately one to two miles per hour in absolutely calm air. Any disturbances from normal flight attitude in these featherweight jobs are usually produced by the effect of propeller torque and not due to wind gusts or external force. Stability is a much simpler problem in the indoor model. Displacements are often due to inertias or to the weights of the parts themselves brought about by changes in flight direction. Under these conditions indoor

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1/32x1/4	2½c	3/32x3/8	3½c	1/16x2	8c
1/32x3/8	3c	1/8 sq. 3 for	5c	5/32x2	10c
1/32x1/2	4c	1/8x1/4	2½c	3/32x2	10c
1/8x3/8	3½c	1/8x1/2	4c	1/8x2	12c
1/8x1/2	4c	1/8x3/4	6c	5/32x2	14c
5/32 sq.	1½c	1/8x1	8c	3/16x2	16c
3/16 sq.	2c	3/16x3/4	6c	1/4x2	16c
3/16x1/4	3c	3/16x1	8c	5/16x2	18c
3/16x3/8	4c	1/4 sq.	8c	3/8x2	20c
3/16x1/2	5c	1/4x3/8	4c	1/2x2	22c
1/8x1/4	2½c	1/4x1/2	6c	1/32x3	10c
1/8x3/8	3½c	1/4x5/8	7c	1/16x3	12c
1/8x1/2	4c	1/4x3/4	8c	1/8x3	19c
5/32 sq.	1½c	5/16 sq.	5c	3/16x3	22c
3/16 sq.	2c	3/8 sq.	6c	1/4x3	25c
3/16x1/4	3c	3/8x1/2	8c	3/8x3	30c
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models commonly recover stability by sideslipping. Consequently, the general design of indoor jobs follows the pattern described above. For instance, indoor duration jobs usually have the wing mounted 3" or 4" above the motor stick so that the CG is well below the wing, Fig. 3. The wing dihedral is considerable. The fin or fins are small compared to the dihedral. In these cases, if the dihedral is large the fin may be large because the dihedral provides more side area forward of the center of side pressure. If the dihedral is small, there is less forward side area and the fin must be correspondingly smaller.

Another feature in the indoor model that contributes to spiral stability is the *low* fin which causes the model to nose up when rolling sideways. This is a trick which corrects the effect of the model dropping its nose in a turn. If the model banks and the nose is pointed up it must rotate through a greater number of degrees about its vertical axis before the nose will be pointed toward the ground in a diving position. If the fin is placed high the model will roll usually with the nose down. If this downward angle is considerable, no further rotation about the vertical axis is required for a dive and disaster. This brings out another point in the design of the well known pylon model. These usually have low fins so that when they bank they roll with the nose up. The low thrust line compared to the high line of resistance also tends to nose the ship up which results in a spiral climb. Anyone who has seen these ships fly will not forget their thrilling spiral climb to high altitudes.

Some may have noted the similarity in design between the pylon and indoor models. This has come about naturally because the designer of the pylon type, Carl Goldberg, was an expert indoor model builder long before he flew outdoors. His indoor models held many records and were the essence of efficiency. Consequently, when he undertook the design of outdoor gas jobs he incorporated in them the familiar features of his indoor ships. As a result the present day pylon model stability is predicated upon theories and facts associated with slow, light models flown in still air.

For this type of ship the features of the pylon model cannot be surpassed. However, in the modern gas job other factors inject themselves which have extreme effect upon model stability. These are mass and speed. Under the effects of these two factors all irregularities and unstable characteristics are magnified a thousand times, so that in *certain* conditions of flight where skidding takes place instead of sideslipping we have baffling unstable tendencies. As long as pylon models can be made to fly without skidding, their behavior is most circumspect. And if they perform as intended, making a steep spiral climb until power dies, no unsatisfactory characteristics are evident because under these conditions skidding seldom results. This maneuver is usually induced from some slight directional flight variation during level or diving flight. A sudden turn to the right or left in level flight will flip the model into a steep bank and spiral dive. This is the other troublesome half of spiral instability which we will discuss later.

* *

Phil Powis of Saskatoon, Sask., Canada sends us sketches, Fig. 4, for an excellent pusher canard model which he has built. He asks for suggestions. Mr. Powis could not have done a better job and there are few suggestions that we can make to improve his design. It would be well for those who are interested in pushers to examine the drawings of his plane carefully.

He has a front wing with large dihedral located high in the structure. He specifies an incidence angle of 3¼ degrees. This high front wing performs two necessary functions. First, it provides a high line of resistance which during power-on flight causes the nose to rise sharply into a steep climb thereby preventing any tendency to spiral in nose first that might possibly exist. The large dihedral of 16° will cause the plane to rock sharply back into level flight *with the nose up* if it happened to bank steeply. The vertical fin area which is usually required on this type of airplane is well placed. It has been found from practical experiments over a long period that a low fin combined with a high front wing well above the line of thrust provides spiral stability either in skidding during high speed level flight or when sideslipping during slower climbing flight. This low fin keeps the center of lateral area (CLA) low which increases the airplane's steadiness and stability. If the large vertical fin is placed on top of the fuselage, the CLA will be high and the plane will bank sharply during high speed turns in level flight.

By this we do not mean to say that good flights cannot be obtained if the airplane is trimmed so that it climbs continually without dropping the nose. The flight may possibly be successful. However, with the CLA high it will be unstable during certain attitudes of flight, chiefly when the airplane is flying horizontally or with the nose down. In such case it is apt to wind up in a tight spiral.

A number of modelers have put forth an argument that if the CLA is low, so that a model does not bank sharply when skidding, there will be no corrective moment when sideslipping. In this they overlook several important factors. The one factor which changes the whole picture is *speed*. A plane skids at high speed but sideslips at low speeds. At high speeds the dihedral angle of the wing when skidding presents only a small increase in the angle of attack on the side toward which the skid takes place, which creates only a slight banking moment. When sideslipping, however, the sidewise motion is much greater compared to the forward motion of the airplane, so the angle of attack of the low wing due to the dihedral becomes much greater and the lift on the low side is much greater than the lift on the outer wing. Consequently, there is a sharper righting effect due to the sideslip—but this will be considered in detail in a future article.

In the case of Mr. Powis' pusher the arrows, Fig. 5, represent the angle at which the air strikes the side of the airplane when it circles to the right. Note the dotted line from the center of the circle to the airplane's CG. This represents the force pulling the airplane toward the inside of the circle and is the radius of the turning circle. The circles have been made very small to illustrate the effect, so you will note that the front wing at A not only travels through a greater circle and therefore faster, but the angle at which the air strikes the nose of the airplane at A, is much greater than that at which it strikes the plane at B, the lower rear fin for instance. So we see that in a sideslip the dihedral of the front wing tending to right the airplane

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Speed Range	1000 to 15,000 rpm

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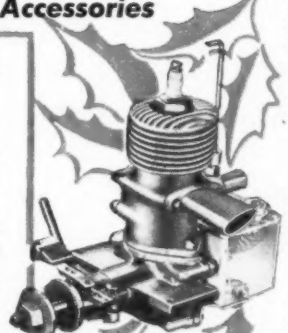

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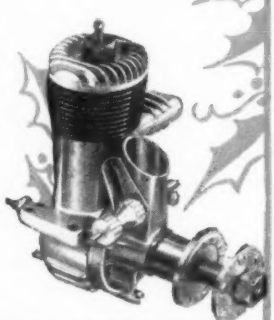

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is much more effective than the lower rear fin which tends to prevent the airplane from rocking back into level position. Actually, the CLA has not been changed but the effect of the forward area and the dihedral of the forward wing has been increased greatly due to the greater air speed and the greater angle of the air striking the forward surfaces. These are just a few thoughts to mull over. We know from actual practice that this arrangement works beautifully.

Everything has not been said yet about the CLA and its effects. There are a number of factors, a discussion of which may shed some further light on the matter. These will be considered in future issues. The nature of such discussion might be suspected if we say that the actual side pressure on the airplane does not always remain at or near the actual structural CLA. Greater or less longitudinal dihedral, lateral diameter, and variation of other design features cause this resultant pressure to move forward, backward, up or down to a greater or less degree. Naturally, if it moves sharply forward and up during some maneuver it will throw the airplane into a sharp spiral.

If any of our readers have any ideas concerning the effect of the CLA we hope they will write to us and describe their thoughts in detail.

World War I

(*Continued from page* 21)

pursuits were concerned we were babes in the woods and didn't have time to grow up.

So with our factories at work on trainers and the DeH-4, our Allies came to the rescue by furnishing the pursuit planes we neither knew how nor had time to make for ourselves. The same commission that visited Europe and came home with plans and licensing rights to build the DeH-4 also came home with recipes for a number of ready built foreign aircraft. These included everything from trainers to pursuits, principally French, and scheduled for procurement according to progress made by our student pilots.

Thus it was in March 1918 that the first operational pursuit planes—Nieuport 28's—were delivered to the Air Service, A. E. F. Now, we've heard a great many tales about the Nieuport 28: how its engine caught fire at the drop of a hat; how its wings would shed their fabric in a high speed dive; that the ship was unsafe and a discarded type which the French foisted upon us from the junk heap.

Of the complaints about the Nieuport 28, the first two—fire and fabric—were true; the latter were absolutely untrue. There was a reason for the danger of fire in the 28, the same danger that plagued all rotary engines: the ignition of unburned gasoline which collected in the cowling. Cowling fires were the result of pilot error 99 times out a hundred. The Gnome rotary engine with which the 28 was powered had only one valve in each cylinder head, an exhaust valve. As mentioned in our previous W. W. I articles, most rotary engines were either "on" or "off"; they could not be throttled as could stationary engines. To obtain a lower power output, controls were available whereby the ignition and fuel could be shut off in certain cylinders.

In spite of intensive training, pilots frequently forgot to shut off the fuel supply when they cut out the ignition. As a result, raw gas poured through the nonfiring cylinders into the cowling and when the fuel became properly mixed with air, wham! If the fire wasn't too bad it could

often be put out by shutting everything off and diving to blow it out.

Then the matter of shedding fabric in a dive: the Nieuport was notorious for that, but again it was the result of pilot carelessness. The 28's wings were extremely thin, with a knife-like leading edge. Because of its fineness ratio, the 28 accelerated quickly in a dive. The combination of these two factors resulted in the frequent failure of fabric at the leading edge. The ship just got away from its pilot at times, and if he attempted to pull out too quickly at high speeds the fabric just couldn't take it. This was not a structural failure in the sense of spars, ribs or fittings giving way. Fabric failure occurred at about 220 mph I.A.S.

If you wonder why our pilots were "forced" to fly the fabric shedding 28, remember that even today, all aircraft, both military and civil, have placarded restrictions.

Was the Nieuport 28 unsafe? Definitely not—properly operated it was a first class fighter. As far as the myth that it was a discarded type is concerned, the French were using it in some of their own squadrons and made it available to us as their supply of Spad 7's materialized. Some of our squadrons also got the Spad 7 which, together with the Nieuport 28 was eventually replaced by the Spad 13. The point is, we didn't pick the 28's up from a junk pile—they were perfectly good ships of new production and their record in the hands of our green pilots fighting against seasoned German aces proves they were equal to first line German aircraft.

DESIGN—Considerable detail of the origin and background of the Nieuport line of aircraft was presented in the August 1944 issue of this magazine at which time the famous Nieuport 17 was discussed. The 28 is a continuation of that line, but in design somewhat of a radical departure. It marked a break in the Nieuport practice of "V" shaped interplane struts, tiny lower wing, flat upper wing and aileron placement.

Early in 1917, when the Nieuport 17 design had been souped-up and beefed-up into models 24 and 27, the basic design had reached its limit of development. It was time for a complete re-design—an entirely new ship—and Nieuport 28 was the result.

Designs were developed quickly in those days, and by mid 1917 the first Nieuport 28 was test flown. The 28 is considered by many aviation historians to have been the most beautiful airplane of W. W. I. It certainly was one of the cleanest and neatest ships to serve at the front. In its design nothing was sacrificed aerodynamically.

The fuselage was round, no larger than the engine, and tapered back beautifully to a vertical knife edge. The engine under the well formed and vented cowling was a Gnome 9N monosoupape (one valve) rotary on early models, delivering 160 hp at 1400 rpm. The engine was rated at 150 hp. Overall length was 20 ft. 6 in., and sitting on the ground the 28's highest point—the wing tips—was only 7 ft. 6 in.

Wings were a radical departure from earlier designs in the line. In planform, both upper and lower wings were rectangular with gracefully elliptical tips. Neither plane had sweepback. Head-on, the lower wing was perfectly flat while the upper wing carried 1-1/2 to 2 deg. dihedral. Upper wingspan was 26 ft. 6-1/4 in., with 51 in. chord. Span of the lower wing, on the ship, was 25 ft. 6 in., and chord was exactly 1 meter, or 39.37 in.

Large ailerons were fitted only in the 28's lower wing, another departure from

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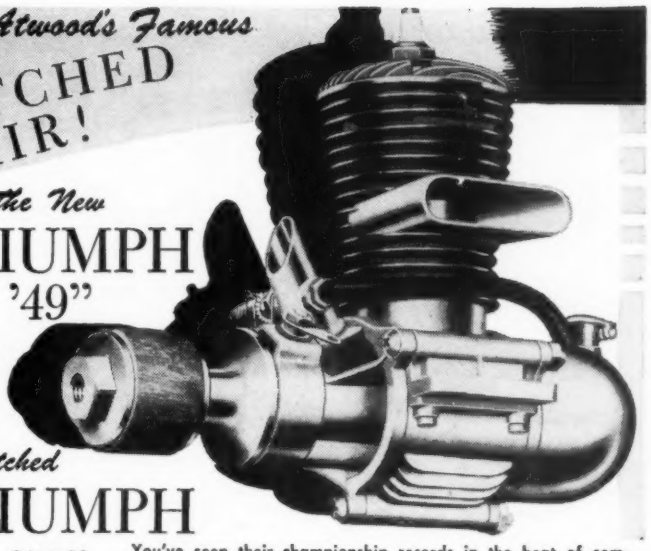

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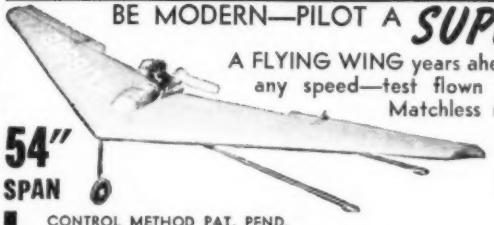

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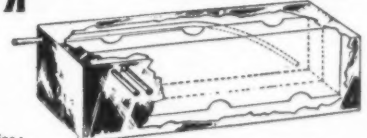

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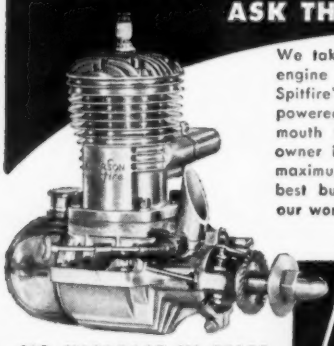

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Nieuport practice. They were controlled entirely by internal mechanism located within the lower wing in order to further cut down resistance. In the same manner, the empennage was designed and constructed as cleanly as possible to reduce drag to a minimum. Elevator controls were entirely enclosed, the actuating bell-crank being located within the vertical fin. The rudder was actuated by cables connected to a very small rudder horn with only a foot of cable exposed on each side.

Through this brief design description and from the accompanying illustrations, it can be seen that the 28's designers made a genuine attempt to create a high-performance airplane in the best tradition of the day.

PERFORMANCE—The ship didn't disappoint its designers or the French Air Ministry when it was submitted for field tests. With a gross weight of 1380 lbs., the 28 had a top speed of 126 mph at sea level, 121.5 mph at 10,000 ft., and 115 mph at 16,500 ft. It climbed to 10,000 ft. in a shade over 9 minutes and attained an altitude of 22,300 ft., its absolute ceiling. The 28 tipped the scales empty at 880 lbs. and carried fuel sufficient for 1 hr. 45 min. operation at full throttle.

In flight the 28 was a simple airplane to operate, it was stable laterally and longitudinally, but of course suffered directionally because of the Gnome engine's gyroscopic effect. Its maneuverability was excellent, especially the rate of roll, and although it spun easily, recovery was simple and quick. It stalled gently with power on at low altitudes, with a decided tendency to spin; it stalled violently with power off or on at high altitudes. All controls were effective right up to the stall, which led most pilots to sit down with a minimum of power on at between 55 and 60 mph.

In order to exploit the basic Nieuport 28 design, a second model was produced, the principal change being its air endurance and an increase in hp to 170 through installation of a Gnome 9R rotary engine. Performance details of this model and a structural description of the Nieuport 28 will be presented next month.

Pfalz D-12

(*Continued from page 27*)

on the wing and fuselage. The entire empennage is blue, except the rudder which is white, and all struts and the wheel hubs are blue. Radiator grill and letter on fuselage are black. To obtain a good finish on the fuselage and empennage, they should be given several coats of wood filler before applying the color.

The cowl hatch is cut out at this time. It can be held in place with large dress snaps. If a rotary valve engine of the type shown on the plans is used, then the radiator front can be cut away and a screen cemented in place to supply air to the engine intake. When the upper wing is in place the model can be rigged with strong button-hole thread for scale appearance as well as extra strength.

The model handles nicely on 60 foot lines of .014" stainless steel wire but shorter lines can be used. Naturally, for inverted flight and certain maneuvers a triangular section even flow tank must be used. Balance the model about 1/2" behind the forward control wire and shift the battery to insure this C.G. location. The model takes to the air in a very short run and is easy to fly—so let's head for the nearest circle and "take off."

Stable Airfoils

(*Continued from page 23*)

the airfoils can be flown close to the speed of sound before experiencing shock waves. The emphasis on aerodynamic requirements produced airfoils which had concave curvature at the rear uppersurface.

For zero pitching moment, the forward portion of the airfoil carries more lift at a given lift coefficient than it would if there were no down load at the rear of the airfoil. The boundary layer over the uppersurface of a zero-moment airfoil is thus closer to separation at a given lift coefficient than is usual for a cambered airfoil with the lift spread more evenly over the chord.

If more pitching moment were allowed, the section would have a higher critical Mach number. Higher critical Mach numbers may be expected when there is an absence of local peaks in the pressure distribution.

Any surface imperfection—such as specks or waves that can be felt by the hand—are probably large enough to cause transition from laminar to turbulent flow ahead of the position of maximum velocity. This transition will cause an increase in drag. Sensitivity to roughness increases as the thickness increases.

Pitching oscillations with amplitudes of about 2° and a frequency of about 2 cycles per second were observed at the high-lift end of the low drag range for NACA 2-H-15, 3-H-13.5, 4-H-12.4, and 6-H-15 sections. No oscillations were observed for the 5-H-15 under the same test conditions. The 6-H-15 airfoil underwent a sudden and violent oscillation at an attack angle of -9.3°. In helicopter application the forces acting along the span of the blades will tend to make the separated flow run outward, and the Coriolis forces will tend to sweep the separated flow off the trailing edge. A somewhat similar condition is imposed on the flying wing.

Best results for all laminar flow airfoils, including the ones described here, are obtained when operating at low attack angles. This is indicated by a curve configuration known as the "bucket" which is formed by plotting C_l against C_d. At high attack angles ordinary airfoils, such as the 230 series, are likely to show slightly better characteristics.

These laminar flow airfoils are even more effective at low Reynold's Numbers because since the airflow breaks into turbulent flow just after it passes the hump, the tail of the airfoil is made concave to suck the air back in. For this reason airfoils of lowest drag have the point of maximum thickness moved a considerable distance toward the trailing edge.

Application of these airfoils to free flight and U-control models may produce results of a higher order than were possible previously.

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6, 52	*All*	Modelpic
14	*Top*	R. Cecchettini
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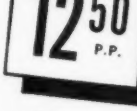

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Report from the West

(*Continued from page* 6)

peared at the starting line, but they put on a show that was really different. For those who are harping for a change from the same old buzzing sound that just goes 'round and 'round, we can heartily recommend that they take in the next Radio Control meet.

The five entrants—Colby Evett and Bill Nuckolls, of Santa Monica, H. H. Owbridge of Burbank, and Virgil Clark and Granger Williams, the *X-Cell* men of L. A. and Huntington Park—put on a 3½ hour show that highly pleased the good-sized crowd. It was good to see the interest shown. Most spectators appreciated the fact that precision played a big part (not that precision doesn't also count in speed) and were able to get a good view of what the modelers were doing.

I particularly liked the remark of a first-time visitor to the W and R field: "There isn't a lot of 'canistrams and leodynes' running around here. We can really see what's going on. Hope they have more of this kind of meet."

Maybe we are going overboard for variety in meets. But when you stop to think of it, fellows, we must continue to create an ever-increasing interest in airplanes.

* *

Perhaps I'm sticking my neck out in turning toward fuels, which has become quite a hot question. There are groups that favor the alcohols, and those who stick to gas and oil. *West Coast Tips* is preparing an article on Fuels that will be of interest to all. We are not going to have the opinions of just one person; many of the men in and around Southern and Northern Calif. are right-now digesting lots of their ideas to present in this article.

* *

Our last item this month is a report on a model airplane Sport Contest sent to us by Bob Hanford:

"The pioneers of West Coast flying of free flight gas models originated what is termed a *Precision Event*. In this type of contest the winner is determined not by duration but by consistency of flights. The model has to conform not only to a set motor run but also to a pre-determined flight time. On Sept. 26 the *Thermal Thumbers* (a wing of the L.A.A.M.) sponsored such an event. Credit for revival of this Precision contest and its success is due to Joe Mekol of the T.T.'s. Joe did all the leg work to obtain the prizes, directed the meet and awarded the prizes. Loren Salisbury, Ralph Conn and Ralph's girl friend, Connie, were indispensable in making the meet a smooth running affair. All the T.T.'s present pitched in to do the timing. Anly Peterson flew in the contest and timed flights for the remainder of the contest. Don James took time off from flying his infinitesimal S.E.5 to give a welcome hand with the timing. Frank Cummings, 1947 national champ, did honors with the stop watch brigade, too.

"Many of the free flight oldtimers regretted having left their planes at home when they saw all the fun. One of the best features of this type contest is that it goes a long way towards preventing modelers from complaining about nearsighted timers. With a 3 min. maximum limit on flight, it is doubtful if any ship will fly out of sight.

"Joe Mekol did something from which all contest directors can take lessons. There were 7 motors donated by engine manufacturers—all were drawn for, not given out in the usual manner. This prevents the winners from showing discrimination in their selection, thereby making the manufacturers of the least desired motors happier, for their kind donations are not shunned 'til the last moment and then grudgingly accepted. Joe also had cards prepared thanking the donors of the motors, which the winners signed when they received their prize.

"Back to the contest—There were 46 paid entries, 38 of whom made at least one official flight. Trophies were awarded to 5th place, motors to 7th, gas model kits to 25th, and merchandise worth at least $3 to all remaining contestants. And, wonder of wonders, there were prizes left over!

"Quite a few unusual ships were turning in good flights. Outstanding among these was Granger Williams (of Vee-Gee fame) flying a semi-scale DeH without benefit of wires. Granger turned in a 3 flight total of 3:40:0 to capture 25th place.

"Bill Sweet did his usual swell job on the mike, and a general good time was had by all . . . First 10 winners and their times are:

"1. Russell Smith, 4:23.5; 2. Jack Butler, 4:22.8; 3. Russel Barrera, 4:22.2; 4. Dick Keith, 4:20.8; 5. Ray Boles, 4:19.8; 6. Bruce Rummler, 4:16.5; 7. Walter Wolf, 4:13.8; 8. Royce Childress, 4:13.6; 9. Andy Peterson, 4:12.8; 10. Dennis Stewart, 4:10.8. .

"No mechanical or electronic device was permitted. Also, no dethermalizers were allowed to function less than the 3 min. max. allowable flight time. The general reaction of model builder to this contest is this: just as in U-Control, which has events for speed, stunt and scale, free flight should have a category for Precision. You never hear U-Controlers say that speed, stunt or scale should be split into separate fields of modeling. Nor should free fighters claim that duration is the absolute and ultimate in that category. Regardless of what type models a person builds he is still a *model builder*."

(For further comments on this type of contest see page 36.)

If you have a point to bring up, air it in these columns—they are designed for you. Send your letters direct to our New York office, 551 Fifth Av., New York 17, N.Y.

(Above) Don James launches his tiny *Campus* CO2 powered *SE5* scale model. (Below) Speed whiz Troy Burris holding his "Twin Invader" which carries 2 McCoy 29's

INDOOR WINNERS

IN much of the country the indoor flying season is upon us, and it is about time to try out one of those microfilm jobs you have always been meaning to tackle. Read in our February issue how the old motor man, Bill Atwood, engages in his *hobby*—building indoor models.

Say "Merry Christmas" with CLEVELAND models

Pick Out Your Next Job From These Lines ——MASTER MODELS • DOLLAR "IT" MODELS • FREE-FLIGHT AND TETHER GAS JOBS • 3 FT. "T" TWINS • GLIDERS • GIANT SCALES • C-O-2 DESIGNS • BEGINNERS KITS

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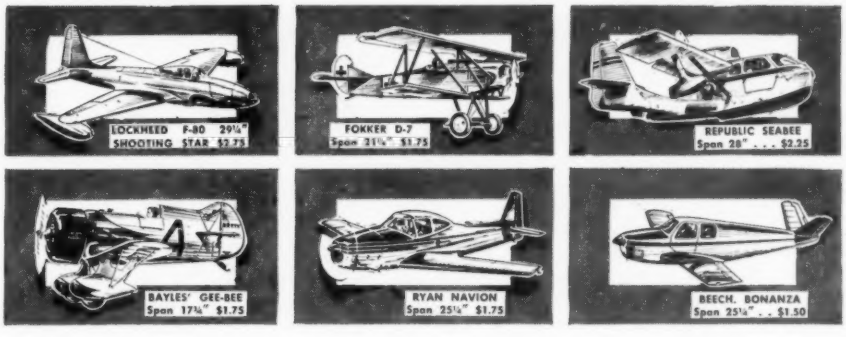
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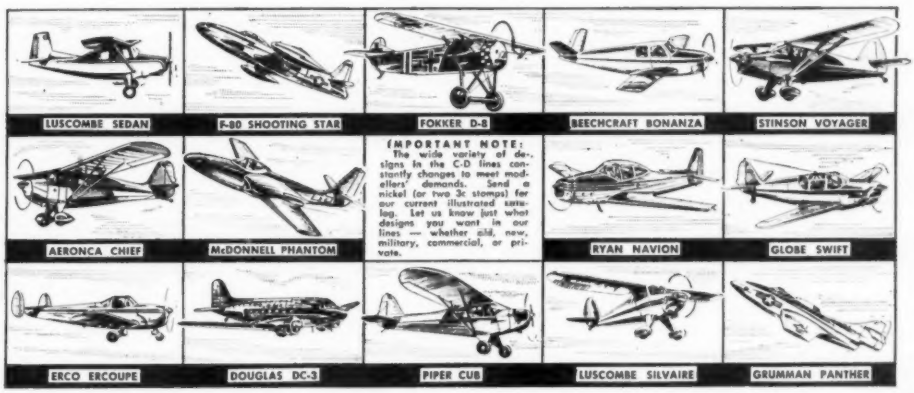
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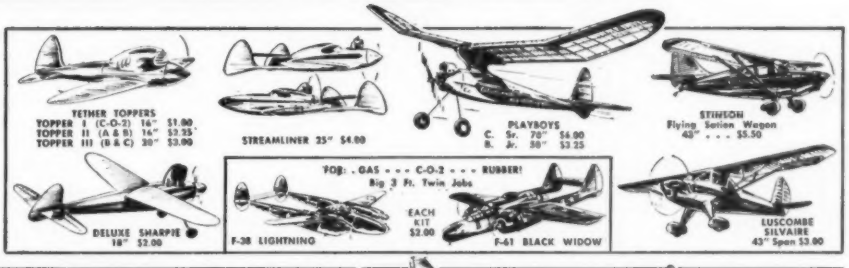
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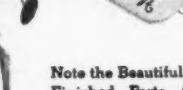

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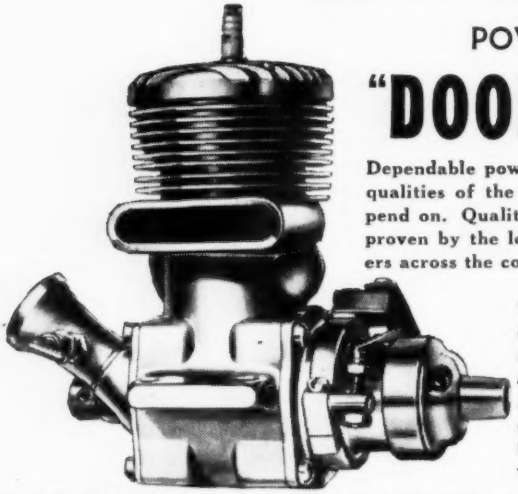

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Model Parakeet

(*Continued from page* 19)

dry. Putting a pre-coat of glue can increase the strength of a glue joint as much as 175%, so it is a good idea to plan on pre-gluing at least all important joints.

Both fuselage sides are made at once, one over the other, and when dry are lifted off and separated. The sides are next joined at the back and the pre-glued crosspieces inserted. While waiting for the basic structure to dry, the noseblock can be cut roughly to shape and the turtle-back formers made. Next the side and bottom stringers are added, followed by the turtle-back formers and 5 stringers. The paper top cowling is now added, and when dry, the cockpit cut out. The fuselage is now ready for the nose cowling. Tack it on lightly with glue and finish the outside shaping process; then remove and hollow the inside according to the plans. Be sure to leave the "meat" where necessary to take the motor beams. Glue the completed cowling permanently in place after attaching the landing gear, and finish by adding the hardwood motor mounts. This completes the fuselage framework. Set it aside until the assembly step.

LANDING GEAR—This is made up of .032" diam. music wire as shown. After assembly the gear can be bound and glued on the fuselage. Be sure to use light pneumatic wheels; they are the best damage saver known.

STABILIZER AND RUDDER—The tail surfaces were originally built up structures, and if you are building the model for rubber power it will help the balancing. However, with diesel power you will need weight in the tail, and it is faster and more satisfactory to make the tail surfaces out of sheet balsa. Note that the stabilizer will have to have the elevator trimmed off one side to install it in the fuselage.

WINGS—Cut the ribs from light quarter-grained sheet balsa. The flat bottom section shown worked very nicely with the small chord airfoil and allows easy assembly and lineup. Be sure to select springy medium wood for the leading edge spar and trailing edges of the wings. The tips on the original model were made from bamboo; however, in deference to modern methods sheet balsa tips are shown in the plans. After the parts have been cut, the wings can be assembled directly over the plans. When thoroughly dry, lift them off the plans and cut the top wing at the centersection. Using the pre-gluing technique, reassemble to the proper dihedral setting.

COVERING AND ASSEMBLY: The proper sequence of covering and assembling is as follows: 1. Glue tail surfaces in place making sure they are lined up properly before you allow them to set. 2. Cover the fuselage and tail surfaces with a good grade of rubber-model tissue, water dope, and when dry apply a thin coat of dope. 3. Cut holes for the lower wing spars and leading and trailing edges. Slide the lower wing framework in place, block in the proper dihedral and glue. Be sure to allow the glue to dry thoroughly. 4. While the lower panels are drying, make up the cabane and interplane struts and gear streamlining. 5. Cover both wings, water dope, and apply one coat of thin dope. 6. Mount and glue the cabane struts firmly in place on the fuselage. 7. When dry glue the top wing on, and after all the joints are thoroughly dry add the interplane struts and the diagonal brace struts. Be

sure the lineup of the ship is O. K. as you proceed because it is hard to correct once the glue has set. 8. The model is now ready for the addition of motor details, windshield and headrest. It also can be given two more coats of plasticised dope (dope to which caster oil has been added for flexibility and to slow down the drawing power). The original ship had a red fuselage and yellow wing and tail surfaces. 9. Install the motor and timer and add any weight necessary to bring the C. G. to the proper place as shown in plans. All glide trimming should be done with the C. G. at this point, and the stabilizer setting adjusted to smooth out the glide as necessary. Thrust adjustment will control the power flight.

Notice the suggested diesel prop. That club shape is not laziness. The blade shape and low pitch near the hub are in accordance with the latest design ideas, and this prop has displayed definite advantages over those following more conventional practice. The wood must be of the heaviest type available, as the necessary thin blade section does not supply an excess of flywheel action at best. Be sure to keep the blades thin almost to the hub.

If the model is to be flown as a rubber powered version, use the prop block cut to dimensions shown. The power is 2 loops of 3/16" brown rubber with an added loop of 1/32 to act as a tensioner. The model should be trimmed to fly to the left under power and glide to the right.

Four for Two

(*Continued from page* 17)

and Chinese engineers, who had received technical educations in the U.S. and England, and a number of American engineers.

With financial assistance of the Indian Government, a new plant was built in Bangalore, Mysore with an operating force of 5000 employees. And the airplane selected for production was the Harlow trainer! Blueprints, jigs and tools were rushed out to India and the first Hindustan-produced Harlow trainer was test flown in August 1941—four months *before* Pearl Harbor.

Production lines began to fill with Harlow trainers, but in April 1942 the Government of India decreed that the factory was to be operated as a government plant and it purchased the private interests involved. Production on the Harlow ceased when the flood of Royal Air Force and U.S. Air Force aircraft in need of repair and overhaul in India became acute. The plant was then converted into a repair and overhaul station and performed valuable work throughout the remainder of the war.

Since V-J Day, Max Harlow has studied and sketched the dream of all aircraft designers: the four-place airplane that suits the pocketbook of the average man. He knew that the design must be simple to build—that was the paramount consideration. But it must have a high cruising speed and be economical to operate. These and other requirements are not easy, but Harlow firmly believes he has hit upon the right combination of ingredients.

The new H-10 is conventional in the extreme, if such a term can be used. It has no flairs or frills, simply a low wing, all metal monoplane designed to carry four passengers. The fuselage is slab sided so that it can be assembled in four major sections in jigs on a bench and then assembled in a mating jig. The wing is built in one piece, thereby saving the

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heavier construction required with spar fittings for bolt assembled sections.

The fuselage is assembled to the wing by simply lowering it into place and riveting through the lower fuselage skin onto extruded angles extending chordwise on the wing. This simple practice eliminated heavy fittings and costly manhours of machining and mating time. The horizontal stabilizer is built in a single piece and riveted to the fuselage through another set of extruded angles in a notch in the after fuselage.

The landing gear is conventional tractor layout with a fixed tail wheel and a retractable main gear. This gear is operated by a simple worm and gear arrangement and locks automatically in the "up" and "down" positions, saving complicated warning systems, emergency equipment and other costs common to most retractable landing gears.

Large skin sheets are used to conserve riveting operations and save assembly time, the large sheets being permissable due to the flat-sided areas to be covered. The control surfaces are all metal and are made of corrugated aluminum alloy to save internal ribs and spars, the corrugations providing the required rigidity.

The pilot and copilot, located in the front pair of seats, are provided with complete dual controls with the elevator and ailerons being controlled by automobile-style steering wheels projecting from the instrument panel. Rudder pedals are perforated castings neatly and conveniently arranged. Two doors are provided on the right side of the cabin to provide entrance over the top of the wing. Large glass panels provide excellent vision through a wide horizontal range, the top of the cabin being enclosed by skin sheets.

In bringing the PJC-2 up to date, Harlow lengthened its nose by the use of a horizontally opposed engine and this longer fuselage length has permitted the use of slightly smaller and more artistic tail surfaces. One of the secrets of the cost-savings in the new design is the use of the PJC-2 wing jigs and tools for the new wing. In many other assemblies the PJC-2 equipment has proved useful, and it is this availability of expensive tooling and production know-how that constitutes Harlow's "ace in the hole" in his new project.

Harlow has formed the Atlas Aircraft Co. and plans to open a plant in the desert area near Hemet, Calif. Another major—even predominate—saving he hopes to make is his own engine. In small, personal-type aircraft the engine is often the largest single item of cost. Initially, Harlow will power the new plane with a 220 hp *Atlas* engine manufactured by an undisclosed East Coast producer. The engine will bear the name *Atlas* and will be guaranteed by Atlas. Eventually Harlow plans to buy an engine company, either Aircooled Motors now owned by the Tucker Corp., or the Jacobs Engine Co., both well known producers of aircraft engines for decades.

The Atlas H-10 has a span of 35 ft. 9 in., is 28 ft. 4 in. long and stands 8 ft. 2 in. high, illustrating the comparatively small size of the plane. It weighs 2082 lb. empty and has a useful load of 1118 lb., approximately the same ratio as the PJC-2. It has an 8 ft. propeller, carries 56 gals. of fuel and has a 90 in. main-wheel tread. Top speed is 170 mph and it will cruise at 150. Landing speed is 55 mph. It has a rate-of-climb of 1200 ft. per min. and a service ceiling of 15,500 ft. Normal range is 800 miles.

There can be no question but what Max Harlow has produced an excellent airplane, one with performance comparable to any other four-placer on the market. But it is that $2995 price tag that poses the big question mark. By simple construction, use of previously available tools and jigs, plant location in an inexpensive labor market and production know-how, Harlow has all the ingredients. If and when he can begin the manufacture of his own engine, then assuredly he will have gone a long way towards providing the miraculous "poor man's" airplane.

To Cowl or Not to Cowl

(*Continued from page* 15)

dynamic pressure developed in flight. The results of this calculation are not worthwhile for model airplanes, and comparable results can be more easily achieved by the cut and try method.

EFFECT OF PROP SLIPSTREAM AND PROP ROTATION—Because of the propeller rotation in an anti-clockwise direction when viewed from the front, the high pressure region existing around the engine cowl is not entirely symmetrical but is displaced to one side. On the right side of the cowl, when viewed from the front, a lip can be installed to assist the induction of cooling air. (See Fig. 3)

PRESSURE BAFFLES INSIDE OF COWLS—Where pressure baffles are built in as part of the helmet type cowl, or where the engine is buried inside the fuselage, the baffles should be so placed that the air flows smoothly around the cylinder cooling fins and is not subject to turbulence caused by the poor disposition or lack of cowling baffles. The interior of all cowls should be finished to a smooth slick finish to minimize skin friction.

THRUST AUGMENTATION—Potential thrust effort may also be derived from the helmet type cowl when placed over the cylinder of an inverted or normally positioned engine. The theory underlying thrust augmentation of this kind as a function of the education of heated air after passing over the cylinder head is very complex, but suffice to say that the radiation of heat tends to accelerate the flow of air through the exit opening of the cowl. This phenomenon is in conformity with Bernouilli's theorem of air flow and Boyle's law relative to the physical characteristics of gases. According to theory, if heat is added to a jet of air flowing through a cowl, an increase in the total available thrust energy will be possible. The heat is added to the air at constant pressure, thereby causing an increase in the temperature and volume. The larger the volume of air ejected through a restricted exit opening, the higher the exit velocity of the jet. The reaction of the jet is converted to thrust effort in turn accelerates the model's forward speed.

INVERTED OR SIDEWINDER ENGINE INSTALLATIONS—The discussion presented here is also applicable to inverted or side mounted engine installations and the same results are possible.

SUMMARY—What has been presented in this article will not enable the reader to attain phenomenal results, but as a part of the whole effort to obtain high speed the data presented here will assist any high speed flyer in improvement of his performance at least a few percent of the existing high speed and this increase may mean breaking the present records.

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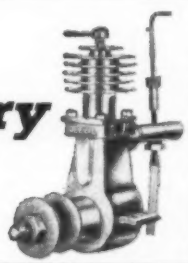

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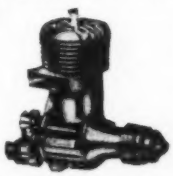

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Air Ways

(*Continued from page* 31)

We fear that photo No. 2 does not do justice to the beautiful ME-109-scale ship built by Lt. Frank R. Schwend. This model is of all-metal construction except for the controls, and the wheels may be retracted by inserting a key just behind the lower air scoop. The ship was built to 3/4" scale which gives a span of 24". Although it is not apparent in the photograph the cockpit is completely detailed with all controls, accurate instrument panel, and so on. This is really a beautiful piece of work.

Working from plans in M.A.N., Frank Paul Benwell, (2916 Wabash St., Michigan City, Ind.) produced the *High Performance Sportster* shown in No. 3. The ship is equipped with all balsa folding prop also made from plans in the magazine. Frank made two of these models and both give 25 to 35 sec. on the average when flying in the evening. The only disadvantage, he tells us, in flying this time of day is that the cool evening air is usually rather damp, and the moisture of course affects the model covering adversely.

We show a real novelty in No. 4, a *Dyna-Jet* powered free flight flyingboat constructed by the well known English modeler Col. C. E. Bowden (21 Motcombe Rd., Branksome Park, Bournemouth). The Colonel has long been an enthusiast for overwater flying since he lives on the seacoast and has fine facilities for this type of modeling. He gives us no description of the model, but its size may be judged by comparing it with the jet motor, and it seems the lack of torque from this style of powerplant should make it ideal for R. O. W. operation.

A beautiful controline scale model of the Albatros D5 was sent in by Don Yearout (708 N. Jefferson, Albuquerque, N. M.), who tells us that this model (No. 5) has won two firsts and two seconds out of four contests, including first place in the N. Mex. Plymouth Elimination. This win entitled him to a free trip to the 2nd Plymouth International Meet. This attractive model is powered by an Anderson *Spitfire* engine, turning a 13-8 prop. Wingspan is nearly 4', and the model weighs 3-1/2 lbs. Following construction of the original plane, the fuselage is completely planked and the wings are fabric covered. All engine controls are operated from the cockpit. Don says the model will loop fairly well and that he has flown it inverted and has had no crackups. This model is presumably an exact scale copy since it was made from one of Bill Wylam's masterplans. The German designers of the real albatros would probably be horrified, though, at the symmetrical airfoil Don has used!

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Omaha, Nebr.) sent in No. 6 which shows him proudly holding the completed framework of a Waco model UPF7 made from a Burgess kit. Although this ship was designed to carry the *Burgess M5* five cylinder engine, Mr. Carr has installed an *Ohlsson 60*. While he has built many rubber powdered and solid scale types in his 16 years of modeling, this is Mr. Carr's first attempt at a gas job, and we hope it will be a great success.

Something very unusual in model work appears in No. 7. This is a genuine miniature turbo-jet engine built by M. Dreher (Uetlibergstr. 92, Zurich 45, Switzerland). Mr. Dreher has also built a scale Grumman F9F *Panther* model in which he installed this powerplant. The latter produces a static thrust of approximately 5 lbs. when the turbine is rotating at 75,000 rpm; the engine is only 16" long and 5-1/2" in dia. It runs on plain gasoline and is started with compressed air. This is the first working model of this type we have ever heard of, and if any other readers have experimented along these lines we would be glad to receive news of their results.

David W. Jones (Taliesin West, Scottsdale, Ariz.) is an enthusiast for unusual designs of models, as evidenced by No. 8 showing two of his "flying pancakes." These unusual controline jobs have rather surprising characteristics. The one on the right, which was originally powered by an *Atom*, has a stalling speed of almost zero; in fact, a lap was once clocked at a speed of 11 mph. Mr. Jones has great hopes for these unusual ships and has undertaken many other novelties in the flying line of which we trust he will keep us informed.

From Italy we recently received No. 9, a diesel powered scale model of the Macchi M.C. 205 fighter, built by Cattaneo Gianni (Via Paracelso 8, Milano, Italy). The plane has a 26" wingspan and it has given good results in speed and handling. Since this picture was taken a cowling has been fitted around the motor, which makes it considerably more scale-like in appearance.

Lt. Don Romer sent us No. 10 which shows a speed model built by R. B. Clark. This airplane is powered by a *Super Cyclone*, and the finish is so fine that it won the Beauty event at a recent contest held at Brooks Army Air Field. The model is built of gauze and plastic wood. Unfortunately it was damaged on the second flight when, after picking up considerable speed, the lines broke. It was not damaged beyond repair, however, and we are sure it will eventually give a good account of itself.

Another model built from M.A.N. plans appears in No. 11, the *Skipper*, made by Chris Spaseff (15501 Robson Ave., Deroit 22, Mich.). The model has proven a fine flier and weighs only 11 oz. complete with prop, timer and cutoff. Since a glow plug *Arden* engine is fitted, the timer operates a D-E shutoff; although the timer stuck on the first flight, allowing the motor to run about 20 sec. and taking the ship out of sight, the model was eventually found and is still flying strong.

Our last picture this month (No. 12) shows a type of plane not ordinarily chosen as a model subject. Submitted by Doug J. Blake (819 First St., Medicine Hat, Alberta, Canada), this French *Maurice Farman* biplane was built directly from a small 3 View which appeared in a recent issue of M.A.N.—it has a wingspan of only 6". The photograph is credited to the Corporal in charge of the Instrument Section at the local R. C. A. F. Station.

NEWS OF MODELERS

In this column we publish the names and addresses of readers (most of them from overseas) who write us that they are anxious to contact American modelers. Some seek a pen-pal; others wish to exchange a foreign jet or diesel for an American engine; some would like to exchange magazines, plans, etc. You will find it very interesting to select one or two names and start a correspondence with these fellow modelers.

PEN-PAL SEEKERS: Russell Doughty, Twyneham House, Upper Clatford, Andover, Hants, England . . . W. Sawyer, 4 Metre Rd., Lambeth, London, S. E. 1, England . . . D. Chafman, St. Margarets Hostel, Stratton, Nr. Swindon, Wiltshire, England . . . J. B. Beaufoy, K 22, Brooklands Hostel, Haynestone Rd., Coundon, Coventry, Warwichshire, England . . . B. Chatfield, Richard St., Opotiki, Bay of Plenty, N. Zealand . . . George Smith, "Tom Croft", Station Rd., Ossett, Yorks, England . . . Frank Hlustik, Stefanikova trida 8, Kromeriz, Moravia, Czechoslovakia . . . Bill Penn, also Ted Penn, 85 Dorchester Way, Kenton, Middx, England . . . Jim Hill, 87 St. Pauls Av., Kenton, Middx, England.

EXCHANGE MOTORS: T. Tohm, 721 London Rd., Westcliff-on-Sea, Essex, England . . . Dennis Gander, White Cottage, Brunswick Square, Tottenham, London, N. 17, England . . . Adriano Losappio, Via Borgo S. Lorenzo No. 10, Firenze, Italy . . . Alexander Imrie, Station Cottages, Humbie, East Lothian, Scotland . . . Peter Caplin, 1106 London Rd., Leigh-on-Sea, Essex, England . . . Frank S. Morgan, Ten Vernon Rd., Rood End, Oldbury, Near Birmingham, England.

EXCHANGE MAGAZINES, PLANS, ETC.: J. E. Hanson, 16 Brettenham Rd., Edmonton, London, N. 18, England . . . W. J. Barton (12-13), 11 Manilla St., Dannevirke, Hawkes Bay, N. Zealand . . . John E. Hyam (15-16), Speedway Hotel, Melton Rd., Leicester, England.

SPECIAL REQUESTS: Stanley S. Bosley, Secy. of St. Georges Heights Model Flying Club, would like to correspond with a secretary of an American model club. Write to him at: 30 Ambleside Ave., Walton-on-Thames, Surrey, England.

CLUB NEWS

Arizona

The *Cholla Choppers M. A. C.* held a closed contest Oct. 3 at Northside model airplane field. Competition was exclusively U-control with entries judged by the point system for Beauty, Stunt, Scale and Speed. Roy Robinson won first honors.

California

L. Salisbury, Secy. of *Thermal Thumbers*, tells us top time of 1:37.8 was turned in by John Kiener at a recent "living room" rubber contest held by the club. Entries were limited to paper covered models of not over 15 sq. in. Site of contest was the living room at Bill Sweet's home. Despite frequent bumping on the 8' ceiling, four flights of over a minute were made.

85 contestants with 147 planes officially entered the U-control contest held August 29 in Martinez. Winners: *Jr. Precision Class B*—James Freshman; *D*—Billie Peden. *Sr. Precision Class A*—W. King; *B*—Wayne King; *C*—John Pedracci; *D*—Gene Stiles. *Open Precision Class A*—Jack Ratzlaff; *B*—H. E. Ross; *C*—Tom Van Dyke; *D*—Tom Van Dyke. *Jr. A*

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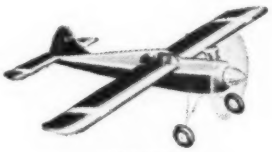

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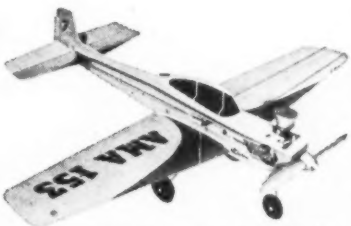

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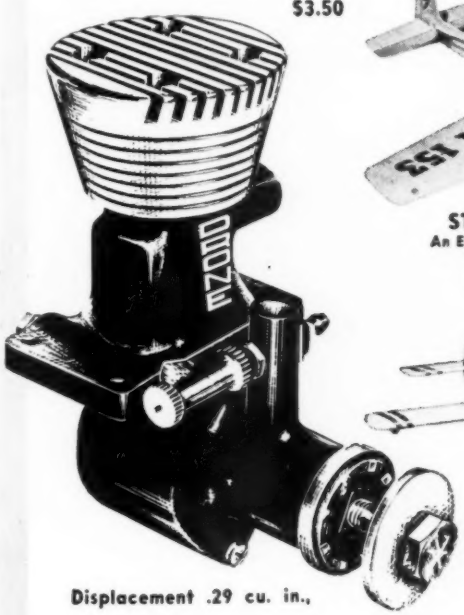

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Bob Hanford and Neil Sauer of Modelpic sent us the following info. Results of the *Los Angeles Aeromodelers'* contest recently held: *Open Towline*—Thomas Osborne, 21:03.0; *Jr. Towline*—Vernon Holmes 3:40.0; *Open H-L*—Jim Powel 7:09.0; *Jr. H-L*—Jack Butler 3:59.2. AMA rules were abided by.

Connecticut

Results of the recent successful *Exchange Club of Southington* meet: *H-L Glider* (Jrs. only)—Gerald Wagner 203.5 sec.; *Combined Rubber Cabin & Stick*—Carl Hermes 450.7; *Jr.*—Glen Ballou 206.8; *Class A Gas*—Chester Orrill 533; *Jr.*—Avery Goddard 175.2; *B Gas*—Joseph G. Dorr 234.1; *Jr.*—Gerald Allen 146; *C Gas* —Thomas Cammo 180; *Jr.*—Raymond Frisco 21.7; *D Gas*—John Sebastianelli 307. Due to strong winds, the time limit for gas flying was set at 10 seconds (H-L).

Illinois

Sec. Bob Clemens of *Nap Air Villains* of Naperville sent us their latest 1948 contest results: *Class A Gas*—Walter Hanson 12:17.2; *B Gas*—Peter Vacco 13:06.6; *C Gas*—Sam Belcher 14:09.3. *Rubber*—Clarence Mills 10:48.5. *CO2*—Bill Ehrlich 8:30.5. *H-L Glider*—Dennis Rushing 4:20.3.

A note from Hart G. Betts of *Aurora Aeronuts* states that the Club was threatened by a citywide ban on flying several years ago but now enjoys wholehearted cooperation from the Mayor and Council. The Club polices its own flying field, put up a protective fence, and has taken out an insurance policy against injury and property damage. Mr. Betts would be glad to tell other Clubs how the present arrangements were worked out. He also states that the *Aeronuts* would like to organize the model clubs of northern Illinois; interested clubs should contact him at 7 Fox Promenade, Aurora.

Iowa

Wally Blake writes that the prizes won at the Tallcorn Model Airplane Assoc. meet have not been received by the contestants as yet. Sponsoring officials have promised to at least send a letter to each winner. It seems repeated trips to Ottumwa, as well as letters, have been ignored; there has been nothing but continued delays.

Secy. of *Waterloo Prop Twisters* L. H. Briden informs us that 192 planes entered the 2nd annual meet of the *Prop Twisters* held Sept. 5. Winners: *Class A Speed*—Jack Baltes 60.7 mph; *B*—Bob McBride 96.7; *C*—Bob McBride 107.1; *D*—Tom Cross 109.7. *Jet*—Warren Swanson 121.5. *Stunt Flying Open*—Al Yount; *Stunt* (under 21)—Norman Mayeda. *Class A. Free Style Open* Endurance—Claude McCullough 13:14; *Class A* (under 21)—Larry Erickson, last year's grand champion, 4:24; *Class B*—John Heasley 10:23.3; *Class C*—Mel Paulson 14:19.3; *Class D*—Ted Wiazlo 12:43.5. *Rubber Powered*—Sid Jepson 7:58.4. *CO2*—Roland Dexter 8:58. *H-L*—R. B. Akers 1:16. *Best Finished Plane*—Carl Witter.

Massachusetts

Here are winners at the recent closed meet of the *Boston Balsa Bees: Stunt*—1. Wm. Mahoney; 2. Fred Glass; 3. Doug Emeneau Jr.; 4. Arthur Richards. *Speed* —1. Bill Ellis 116.6; 2. Hugh Range 114; 3. Doug Emeneau Sr. 112.9. The Club has just completed construction of a new clubroom, with indirect lighting, large workbench, etc. All interested modelers in Boston and vicinity are urged to get in touch with George McGinnis, 12 Guilford St., Allston, Mass.

Holder of title "Grand Champion of the Great Southwest" (won at Southwestern Model Meet in Dallas, Tex.) flier Dave Webb contemplates motor won as a trophy and dreams up a new ship for it. (Thanks to Bill Kuntsman and Russ Halford for sending this photo.)

New Jersey

The *Jersey Model Club* held a contest Sept. 26 at their field in Garfield. A majority of the members showed up early and stayed late. The flying was spectacular as some of the members attempted stunts they had never tried before. Results in some cases were not too good, but everyone has to learn sometime—so why not at a contest. Secy. Gilbert Evans sent this info to us.

New York

The *Long Island Gas Monkeys* had fair skies and fine flying weather when they held their 1st annual FF contest at Bethpage, Aug. 15. Winners: *Class A*—Ralph Miller 807.5 sec.; *B*—Martin Sobel 753; *C*—Jack Oless 541; *D*—Powers Letebiv 757; *Jr. High Single Flight*—Jim Reid; *Beauty Event*—Lan Wiggins.

Another 1st annual (Gas) meet was recently held on the farmland adjacent Grumman field at Bethpage by the *Cloudhoppers M. A. C.* Here are the results: *Class A*—Jerry Stoloff 11:33.3; *B*—Fred J. Otten 15:32.1; *C*—Bryton Barron 11:02.5; *D*—John Thompson 21:10.3.

Ohio

James D. Walter, Secy. of the *Cincinnati Control-liners* writes that club members meet every Wednesday evening at Don's Hobby Supplies, 2131 Washington Ave., Norwood, and discuss the usual topics. Also, they now have a blackboard which they use to explain important points in the model design. This form of explanation is very helpful to both old and new model builders.

Oregon

Results of the 2nd Annual Southern Oregon FF contest held in Medford, Aug.

22: *Jr. Class A*—R. Margali 3:31.2; *B*—David Feuz 3:36; *C*—entrants, but no flights; *D*—C. Young. *Sr. Class A*—J. Feuz 5:11.4; *B*—S. Ryder 2:49.4; *C*—S. Ryder 5:36; *D*—J. Feuz 3:20.9. *Open Class A*—E. Benedict 5:20; *B*—B. Thornton 9:54.4; *C*—Dr. Nichol 5:08.1; *D*—E. Roth 4:23.4.

Here are results of the *Central Oregon Model Ass'n.* 1st annual contest held Sept. 5 at Redmond Air Base. *Stunt*—Ken Gardner. *A Speed*—Keith Gardner; *B*—Keith Parkinson; *C*—Keith Parkinson; *D*—Ken Gardner. Events were all open.

Texas

Results of the annual Southwest Championships held in Dallas Sept. 18-19, sponsored by *Exchange Club of Dallas*: *Stunt* (all engine classes combined) *Jr.*—Dave Webb 306.5; *Sr.*—Don Still 222.5; *Open*—Leland Morton 224.5. *Workmanship & Appearance* (all engine and age classes combined)—J. W. Jones. *Jet Speed* (same)—Eugene R. Evans 116.84. *Speed Event Jr. Class A & B combined*—Bobby Krider 124.09; *Jr. Class C*—Bobby Krider 133.38; *Jr. Class D*—Charles Mullin 109.18; *Sr. Class A & B combined*—Maurice Stanglin 120.76; *C*—Maurice Stanglin—134.27; D—Val Jean Feist 128.15; *Open Class A & B combined*—Jim Clem 119.16; *C*—Jim Clem 124.95; *D*—L. J. Smith 133.78. *Combat Event* (all engine and age classes combined)—Dave Webb. Awards given were: Exchange Club Grand Championship Trophy—Dave Webb 37 points; Sportsmanship Award—Skipper Agnew; Youngest Contestant—Dickie Mathis (7 years) 99 pts. in Stunt. Fastest Flight of Contest—Maurice Stanglin 134.27 mph. Worst Crackup—Marvin Wright. Pylon Polisher—Harry J. Fiegel Jr. Bonehead Award—Johnny Clemens. A complete list of the meet results were mailed to every contestant and to each manufacturer or jobber who contributed prizes to the meet. Aviation Chairman John E. Clemens believes this is the first time such a complete coverage service has been extended to all contestants and donors.

Canada

Here is the outcome of the *Canadian National Model Aircraft* contest held Sept. 3 at Varsity Stadium and Sept. 4 at De Havilland Airport: *Grand and Senior Champion*—Harold De Bolt; *Jr. Champion*—Stanley Venis; *Winner of Toronto Star Trophy*—John Kavulich. Runners up for Grand Champion—John Kavulich and Hockin Bros.; Runner up for Jr. Champion—Ken Kennedy. FF Results: *Sr. Class A Gas*—Hockin Bros.; *B*—John Kavulich; *C*—John Kavulich. *Jr. Class A Gas*—Warren Kelley; *B*—Lloyd Carroll. *Fuselage Sr.*—Frank Loates; *Jr.*—Stan Venis. *Stick Sr.*—Roy Nelder; *Jr.*—Ken Kennedy. *Towline Glider Sr.*—Ron Ferguson; *Jr.*—Wally Loates. *Jr. CO2 Event*—F. Blumenthal. *U-control* winners: *A Speed*—H. De Bolt; *B*—Ron Kosmalo; *C*—Ron Kosmalo; *D*—L. Mettatal; *Stunt*—H. De Bolt; *Realistic*—Lloyd Shales.

Canal Zone

Canal Zone M.A.C. was organized in May '48 and now has 18 active members. They have been fortunate enough to secure a special permit from the P. C. Bureau of Recreation to fly their models every Sunday at Balboa Stadium from 9 a.m. to noon.

Hawaii

A gala three-day model airplane show, attended by 3,000 spectators, inaugurated the official opening of the regulation model flying area at Hickman Field on

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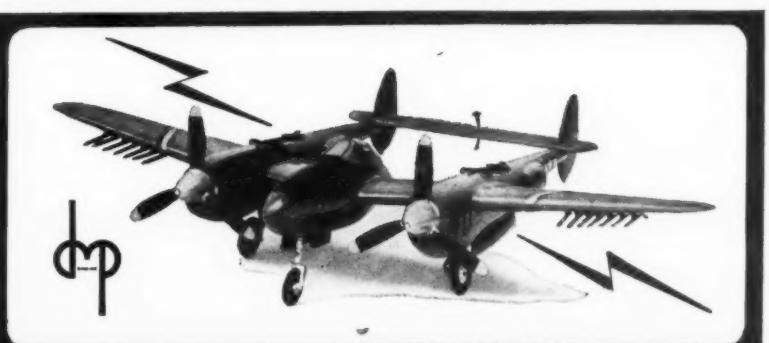

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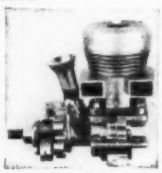

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Air Force Day. 200 modelers registered in the contest (under AMA rules) that included stunt, scale, speed and novelty events. Participants were supplied with workbenches, starting motors, batteries, glue and paint. Officers of the Pacific Air Command acted as judges, and trophies were presented by the Air Force.

Flash News

(*Continued from page* 1)

takes off on its standard four Wright R-1820 Cyclone engines and, once in the air, the big engine is started up. On numerous occasions all four of these engines have been shut down and the huge craft flown on the turboprop engine alone!

WRIGHT TURBO-CYCLONE 18 is a conventional R-3350 double-row radial engine of the type that powered the war-winning B-29 bomber with three turbines attached. Exhaust gases, instead of being dumped overboard, are expanded through these turbines, which are geared directly back into the engine shaft, thereby using the energy of these gases for direct engine power rather than waste. By this "free" power, Wright engineers have stepped up the power of the engine to 3000 hp and make it possible to reduce its fuel consumption equivalent to a range increase of 20%!

that school officials decided to produce a prototype. The engine consists of the turbine from a turbosupercharger to which a single combustion chamber and a tailpipe are added. The combustion chamber provides the hot gases for the turbine, which is geared directly to an air compressor on the other face of the unit. This compressor, in turn, provides high pressure air to the combustion chamber. Cal-Aero intends the design initially as an economical target plane and if flight tests prove satisfactory it will be offered as the world's first jet propelled private airplane.

NORTHROP AIRCRAFT has revealed the most powerful aircraft engine ever built: a 10,000 hp turboprop! Known as the Northrop Turbodyne, the huge unit is the latest in a series of gas turbine engines developed experimentally over the past five years by the company. Far too large for installation in any aircraft presently available, the giant engine will undergo test stand runs for the AF. Both the company and AF have indicated eventual production of the unit.

AS IF SUCH NAMES as the *Phantom* and the *Banshee* were not ghostly enough, McDonnell Aircraft Corp. has named its new XF-85 parasite fighter the *Goblin*, and its even newer XF-88 all weather fighter the *Voodoo*.

This McDonnell XF-88 penetration fighter is intended for long range use as a fighter-bomber or bomber escort

PRATT & WHITNEY has added a conventional tail pipe and nozzle to its huge Wasp Major engine, thereby utilizing the exhaust gases for power production in the form of added jet thrust. The basic engine has been improved by removing the heavy power drag of the internal gear-driven supercharger, addition of fuel injection, low tension high frequency ignition system and strengthening of internal engine parts. These improvements have raised the power output to more than 4000 hp! Supercharging is accomplished by a gas turbine and outlet from which is passed into the tail pipe, which has a variable-area discharge nozzle. From this Variable Discharge Turbine, the initials VDT are obtained, the name of the new engine. It is slated for installation in the new Boeing B-54 medium bomber, essentially a standard B-50 with the new engines installed.

WHAT MAY BE THE first jet propelled personal aircraft is the new design under construction by Cal-Aero Technical Institute, Glendale, Calif. A tiny single seater, it will feature a butterfly-tail, all metal construction and a turbojet engine assembled from surplus turbosupercharger parts. It is designed to have a top speed of 250 mph and a range of 325 miles. It has a 20 ft. 10 in. span and is 17 ft. long. The design originated as a student class project but upon completion it looked so "good"

LATEST AIRCRAFT to take the air is the brand new Vought XF7U-1 tailless Navy jet fighter plane, which has been flown successfully at Naval Air Test Center, Patuxent, Md., under heavy wraps. The odd looking craft features a swept-wing with small fins located half way out their span. Pilot and two Westinghouse 24C turbojet engines are located in the wing centersection. The plane features leading edge flaps to provide high lift for the swept-wing at low speeds. Navy has already ordered quantity production of the strange craft. Incidently, the XF5U-1 *Flying Pancake* project was cancelled many months ago with no official announcement from the Navy.

HOWARD HUGHES IS GOING to do it again! He announced plans to fly his big boat very shortly, and perhaps as you read this the world's largest airplane will have made full fledged flights, as compared to the "accidental" lifting of the 200 ton giant from the water during taxi tests a year ago.

EVER HEAR OF a four engined lightplane? Well, believe it or not, Monsted-Vincent Aeronautical Inc., New Orleans, La., is now flying a fiveplace all-metal monoplane powered by four Continental 85 hp engines mounted in the wing and driving pusher propellers. The plane weighs 4800 lb. and has a cruising speed of 145 mph. Believing that the four engines pro-

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vide the highest flight safety factor of any personal or executive aircraft now available, the designers hope to market the airplane within the next two or three years. The design is squarish and features the location of passengers in the fuselage nose forward of the wing. Fully retractable tricycle landing gear with the main gear units folding rearward into the fuselage similar to the Douglas XB-42 and XB-43 *Mixmaster* design is a feature of the design.

"SKY NIGHT" is the name for the new Douglas XF3D-1 all-weather fighter designed to operate from the Navy's carrier decks at night or in periods of restricted visibility. The new fighter features the popular side-by-side seating of the two man crew, to enable both to work closely with radar equipment. Powerplant units are also side-by-side with the two Westinghouse 24C units nestled in the belly. Fuselage dive brakes permit long dives without building up excessive speed. An unusual feature of the F3D is the use of a belly "bail out" hatch through which the pilot and radar-operator escape in emergency in distinct contrast to the overhead ejection employed heretofore. Search radar is mounted in the nose, with the 20mm cannon armament located on either side of the plastic nose covering the antenna unit. Navy ordered 30 of the craft and AF is rumored to be eyeing the new plane as a standard all-weather fighter.

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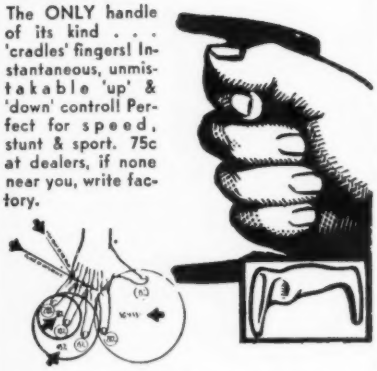

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Index to ADVERTISERS IN THIS ISSUE

A-J Aircraft 39
Aeromarine Co. 51
American Hobby Specialties 35
America's Hobby Center 2, 3, 4, 5
Mel Anderson Mfg. Co. 50
Aristo-Craft Miniatures 64
Atwood Mfg. Co. 49
Austin-Craft 60

B & D Racing Engine Laboratory 62
Berkeley Models, Inc. 32-33, 64
Burbank Mfg. Co. 56

Cal Aero-Technical Institute 7
Carter Craft Models 44
Cleveland Model & Hobby Supply Co. 53
Comet Model Hobbycraft, Inc. 6
Compania Comercial Fortuna, S.A. 60
Consolidated Model Engineering Co. 58
Crescent Model Shop 47

Dale Modelcraft Specialties 49
Dooling Brothers 54
Douglas Model Distributors 46
Drone Engineering Co. 59
O. Duboise 44
Dyna Model Products Co. 61

Eastern Supply Co. 51

Forster Brothers 48
Four Star Model Builders Supply 45
Francisco Laboratories 56

GMCO Modelcraft Hobbies 55
Gotham Hobby Co. 57

H & H Model Motor Co. 46
P. D. Hays Co. 62
Herkimer Tool & Model Works, Inc. 37
Hobbycrafts 45

K & B Mfg. Co. ..... 3rd Cover
Kramer Bros. Model Distributors 40

Lansco Model Aircraft 57
Lucas & Smith Mfg. Co. 39

Megow 54
Mercury Model Airplane Co. 52
Micro-Bilt Corp. 9
Midwest Model Supply 60
Minijet Sales Co. 64
Minnesota Engine Works 8
Don S. Mitchell Co. 49
Model Aeronautics 50
Mod-Kraft 62
Mohawk Engineering Co. 42
Modelcraft Hobbies Retail, Inc. 43
Monogram Models 48

Ohlsson & Rice, Inc. ..... Back Cover

Pierce Industries 41

Bob Roberts 38

Scientific Model Airplane Co. 36
Sky Hobby, Inc. 64
Claude C. Slate 40
Nathan R. Smith Mfg. Co. 58
J. Spokane & Co., Inc. 57
Sterling Models 61
Super Cyclone, Inc. 7

Testor Chemical Co. ..... 2nd Cover
Trim-Craft 44

Victor Aerosearch 8

January 1949

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